

THE IRON AGE

ESTABLISHED 1855

New York, November 27, 1930

VOL. 126, No. 22

Twenty Alloys for Gray Iron

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METALLURGICALLY, this is the age of alloys. As usual, steel leads the way. At first, small additions of nickel, chromium, copper, etc., were made. As the greatly enhanced value of the metal became apparent, progress became rapid, and today everyone is familiar with the wonderful stainless irons and steels. A beautiful example is the glistening tower of the Chrysler Building.

Some 20 years ago attempts were made to add various metals to gray iron, with a view to increase its strength or corrosion resistance. Not until the last decade has there been any great commercial progress. During this period, the use of alloys in gray iron has been systematically and successfully introduced and many have read with surprise the statement

that alloy gray iron was produced in 1928 in the enormous amount of 700,000 tons. (Cone, THE IRON AGE, Aug. 1, 1929, page 282).

Despite this staggering total, the authors feel safe in stating that alloy cast iron is in its infancy, technically and commercially. Alloy steel did not really come into its own until the austenitic steels were developed and in a precisely parallel manner much work is being done at present toward the development of austenitic gray irons. As Mr. Coyle pointed out at a recent technical session, "gray iron is simply steel interspersed with graphite."

We are all familiar with the terrible ravages of rust. It seems highly probable that within a few years this enormous economic waste will be greatly

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DEMAND for alloy gray iron castings is growing. What the foundryman wishes to know is what alloys he may use and how he should use them to better his product. The case of each of fourteen alloying elements is here set down, and the compilation becomes a compendium of information not easily otherwise obtainable.

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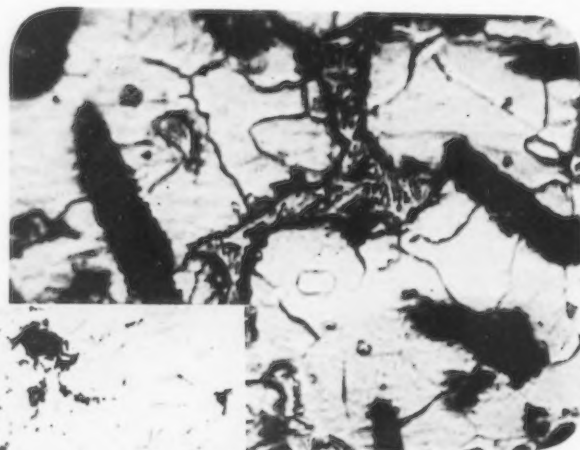


reduced, as a large proportion of the steel and iron will either be completely non-corrosive or at least partly so. Where now the housewife takes pride in stainless cutlery, it is possible she may soon rejoice in a polished non-rusting cast iron stove or furnace.

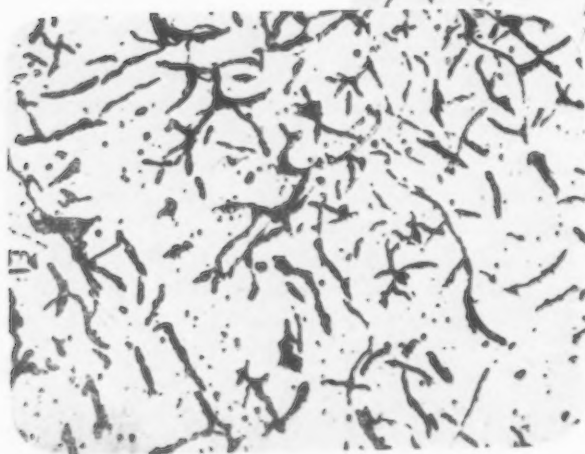
To the foundryman now engaged in the manufacture of gray iron castings, the subject of alloys comes up with increasing frequency. In particular, he is confronted by two questions: 1. Will incidental alloys in his various raw materials be detrimental to the integrity of his product? 2. What alloys can he use successfully and how can he use them to the betterment of his product and the enhancement of his profits?

The literature on this subject is so voluminous and widely dispersed as to make it impractical for the busy foundryman to obtain quickly the published information on any given alloy. This paper is an attempt to give that information. In many

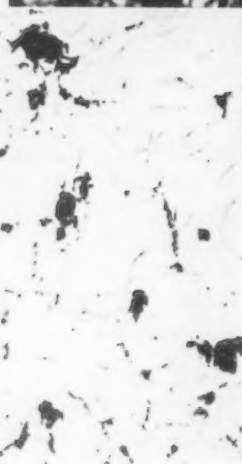
VERY soft gray iron. Ferrite and Graphite. (Right) Deoxidized with Aluminum. Etched. X500



MODERATELY soft gray iron. (Below) Deoxidized with Aluminum. Unetched. X100



HIGH test molybdenum gray iron. (Above) Molybdenum 0.65 Per Cent. Unetched. X100



cases data are very incomplete as only preliminary investigations have been made. In some instances, investigations are now under way, and the results are not yet available.

Aluminum

ALUMINUM is an active deoxidizer and with certain restrictions acts as a degasifier. (Keep, *Trans.*, A. I. M. and M. E., Vol. 18, 1889). It has a strong softening effect, breaking up carbides and forming graphite. Up to 0.10 per cent, aluminum has a definite softening effect (Piwowarsky, *Stahl und Eisen*, Vol. 45, Feb. 26, 1925, page 289), and up to 0.5 per cent it continues to separate out graphitic carbon. From 0.5 per cent, graphitic carbon decreases being only 0.20 per cent of graphite with 11.8 per cent aluminum.

(Melland and Waldron, *Journal (British) Iron and Steel Inst.*, Vol. 2, 1900.)

Aluminum may also be used to turn white iron gray, although in this respect it is about half as effective as silicon. From 0.50 to 0.75 per cent aluminum will usually change white iron to gray. It also decreases shrinkage and chill and increases fluidity. (Payne's *Founders Manual*, page 266.)

In using aluminum as a softener, two difficulties are usually encountered. Almost invariably a film of aluminum oxide is formed on the surface of the iron and is carried into the mold, causing a wrinkled sur-

face on the casting. This is often offset by the non-adherence of the sand to such castings. In most cases the sand shakes off from the surface, leaving a practically clean casting.

The other difficulty, found by the authors and others, was due to a heavy evolution of gas from the iron in pouring. This will often result in a badly honeycombed casting. (Hogg, *Journal Iron and Steel Inst.*, No. 2, 1894, page 104, and Hamasumi, *Science Reports*, Tohoku

Imperial University, Series 1, No. 13-2.)

Effect of High Percentages

Additions of aluminum up to 8 per cent result in soft machinable gray iron. From 8 to 18 per cent, the metal becomes hard and brittle, carbon being combined. From 18 to 25 per cent there is another relatively soft series of alloys. (Everest, *Foundry Trade Journal*, Aug. 25, 1927, page 169.) High aluminum irons showed non-magnetic, anti-corrosive and non-oxidizable properties, but were unstable in moist air. (Everest, *Foundry Trade Journal*, Jan. 17, 1929, page 46.)

Aluminum in small percentages decreases magnetic induction, permeability, and residual magnetism, but increases coercive force and hysteresis loss, according



Airplanes use alloy gray iron

to Piowowsky, *Hochwertiger Grauguss*, 1929, page 190.

There is some uncertainty as to the actual combination of aluminum in cast iron, although it is possible that it enters into solid solution as $FeAl$. (Gwyer, *Zeitschrift für Anorganischen Chemie*, Vol. 57, page 129.) Melting loss varies but is stated to be about 5 per cent.

It would seem that aluminum has three distinctly valuable possibilities in the foundry:

1. Addition of not more than 0.10 per cent as a softener and deoxidizer.
2. Additions up to 0.5 per cent in order to turn white iron gray.
3. As a corrosion resisting alloy of austenitic type with about 18 per cent aluminum.

Antimony and Arsenic

VERY little information is available on the effect of antimony in cast iron. It is stated that the separation of primary austenite and the solidification of the eutectic are both lowered and that its action is similar to that of tin, which is a hardener. (Goerens and Elligen, *Revue de Met.*, No. 5.)

It is well known that iron ore in various parts of the world carries small percentages of arsenic. This probably acts as a hardener but amounts found are insufficient to have notable effect. In normal iron, arsenic up to 0.1 per cent had no deleterious effect. (Piowowsky, *Hochwertiger Grauguss*, 1929, page 288.)

Bismuth and Boron

THERE are no published results on the effect of bismuth in cast iron. A series of experiments now under way by the present authors would seem to indicate that bismuth may be used to advantage in some types of cast iron.

The general opinion seems to be that boron increases hardness and makes the metal brittle, preventing formation of graphite. An addition of 0.4 per cent made the iron difficult to machine while 0.8 per cent made it decidedly brittle. (*Stahl und Eisen*, 1914. H.

1530.) Another investigator found increased shrinkage but no brittleness. (Campion, *Proceedings*, British Foundrymen's Assoc., 1917-1918, page 81.)

Calcium and Cerium

CALCIUM up to about 0.2 per cent was found to have no effect on tensile strength, transverse strength, fluidity, or shrinkage. (Smalley, *Engineering*, Vol. 114, 1922, page 277.) Calcium silicide is employed by one

company as a graphitizer for white iron.

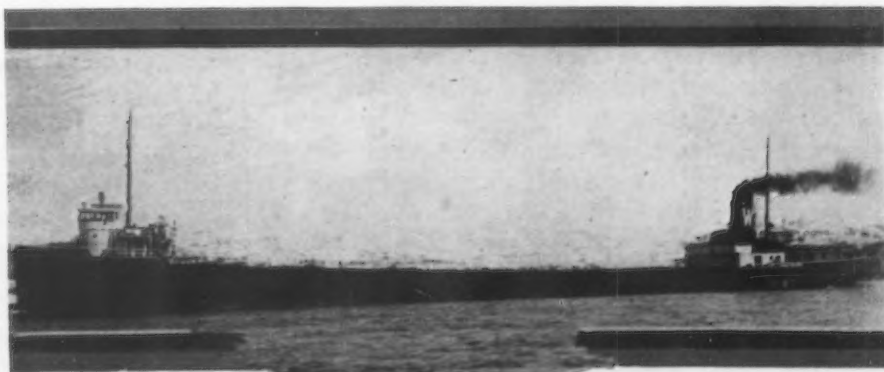
On the subject of cerium cast iron, there has been little published and this mostly contradictory. Dr. Moldenke states that cerium is an active deoxidizer; that when added up to 0.15 per cent, it increases transverse strength about 18 per cent with an increased deflection—also, that the iron is more fluid. (Moldenke, A. F. A., 1919, page 368.) Prof. Piowowsky, in his recent book on high strength cast iron, says that cerium has no effect on cleaning of the iron, shrinkage, or tensile strength. (Piowowsky, *Hochwertiger Grauguss*, 1929, page 286.)

Chromium

THE use of chromium in cast iron is usually connected with nickel. However, chromium by itself, has certain advantages, and, by reason of its low cost, will find many applications.

In general, chromium increases chill, carbides, hardness (Merica, *Handbook*, A. S. S. T., 1930, page 340) and shrinkage. (Campion, *Proceedings*, Brit. Foundrymen's Assoc., 1917-1918, page 81.) It forms double iron-chromium carbides, remaining as eutectic. (Hatfield, "Cast Iron in the Light of Recent Research," page 109.) Probably the matrix is also hardened in gray iron as it may be in steel. (Arnold and Read, *Jour. Iron and Steel Inst.*, Vol. 1, 1911, and Hanson, *Foundry Trade Jour.*, Nov. 8, 1928, page 337.) Graphite is made much finer. Difficulty in machining is often encountered when chromium reaches 0.4 to 0.5 per cent, owing to carbides. However, the carbides can be broken up by additions of silicon or nickel.

Alloy iron a factor in ships



The Iron Age, November 27, 1930—1585

TABLE I—EFFECT OF CHROMIUM ON STRENGTH AND HARDNESS OF GRAY IRON*

Mark	Chromium, Per Cent	Tensile Strength, Tons per Sq. In.	Brinell	Combined Carbon, Per Cent
P	O	16.6	223	0.68
Cr. 1	0.20	17.0	235	0.70
Cr. 2	0.39	18.4	248	0.93
Cr. 3	0.66	17.8	255	1.13
Cr. 4	0.78	15.8	262	1.25
Cr. 5	0.90	13.4	277	1.53

*Donaldson, *Foundry Trade Jour.*, June 27, 1929, p. 489.

Hardness.—Small amounts of chromium harden gray iron, as little as one or two-tenths of a per cent being noticeable in machinability, and increased hardness. Hardness increases with chromium, and at 4 per cent chromium the iron is permanently white. (Edwards, *Journal, Iron and Steel Inst.*, 1920, Vol. 1.) The typical effect of chromium on hardness is shown in Table I.

Strength.—Chromium additions increase strength up to about 1 per cent chromium, then decrease it slowly. (Keep, "Cast Iron," 1916, page 212; Campion, *Foundry Trade Jour.*, 1918, Vol. 20, page 467, and Smalley, *Proceedings, Inst. Brit. Foundrymen*, 1922-3, Vol. 16, page 495.) Another investigator reports that 0.4 per cent chromium raised tensile strength from 33,000 lb. per sq. in., to 45,600 lb., with little change in structure, and no embrittlement. (Hamasumi, *Foundry Trade Jour.*, 1925, Vol. 32, page 71.) Another finds that 0.5 per cent chromium increases Brinell hardness 20 per cent and shock resistance 10 per cent. (Piowarsky, *Foundry Trade Jour.*, 1925, Vol. 31, pages 331 and 345.) Table I shows effect of chromium on strength, silicon being about 1.42 per cent.

Growth and Corrosion.—At high temperatures, chromium cast iron has a decided field of usefulness, on account of its resistance to oxidation and growth. It increases the stability of the carbides, at least up to 1022 deg. Fahr. (550 deg. C.), and improves the strength at all temperatures, probably due to the chromium carbide in the cementite of the pearlite. (Donaldson, *Foundry Trade Jour.*, June 27, 1929, page 489; Westgren, Phragmen, Negresco, *Jour. Iron and Steel Inst.*, Vol. 1, 1928, page 383, and Donaldson,

Proc., Inst. Brit. Foundrymen, 1924-5, Vol. 18, page 89.) On repeated heatings up to the same temperatures, ordinary gray iron grows, which property is often detrimental, but similar iron to which chromium has been added (0.20 to 0.39 per cent), contracts (according to Donaldson, above). At higher temperatures (1652 deg. Fahr. or 900 deg. C.) 1.5 per cent chromium retards growth, but does not entirely prevent it. (Andrew and Hyman, *Journal, Iron and Steel Inst.*, 1924, Vol. 1, page 451.)

Small amounts of chromium make gray iron slightly corrosion resistant, especially in sea water and weak acids. (Kotzschke and Piowarsky, *Arch. Eisenhüttenwes.*, 1928-9, Vol. 2, page 333, and Hudson, *Foundry Trade Jour.*, Aug. 8, 1929, page 100.)

Procedure.—When used without nickel, chromium is best added in the form of crushed ferrochromium (65 per cent), added to the ladle. The ferrochromium must be crushed and the iron hot, or solution will be incomplete. Carefully used, loss may be 5 per cent. Chromium added to the cupola charge is oxidized, with heavy losses, so this method is not practical.

Chromium, by itself, would seem to have a wide field as an alloy for cast iron, and an even broader field when used in combination with other metals, such as nickel and possibly aluminum. There is also a strong possibility of valuable cast alloys for high heat and corrosion resistance, with 20 to 30 per cent chromium.

Cobalt

LITTLE has been published on the effect of cobalt in cast iron. Up to 2 per cent it is reported to give no useful results. It apparently reduces graphitic

TABLE II—CASTING TEMPERATURE, 1350 DEG. C. FOR GRAY IRON CONTAINING MANGANESE*

Test No.	Analysis					Physical Tests		
	Total Carbon, Per Cent	Graphitic Carbon, Per Cent	Combined Carbon, Per Cent	Silicon, Per Cent	Manganese, Per Cent	Maximum Stress, Kg. per Sq. Mm.†	Brinell No.	Machinability
1	3.01	2.27	0.74	1.79	0.38	27.65	191	Very soft
2	3.01	2.18	0.83	1.73	0.40	28.25	191	Very soft
3	2.82	1.90	0.92	1.89	0.45	28.39	207	Very soft
4	2.94	2.16	0.78	1.86	0.51	29.92	205	Very soft
5	2.82	1.97	0.85	1.54	0.61	28.58	203	Very soft
6	2.84	2.07	0.77	1.78	0.9	31.88	217	Soft
7	2.86	1.99	0.87	1.65	1.10	34.35	217	Soft
8	2.82	2.07	0.75	1.91	1.45	33.46	227	Soft
9	2.73	1.81	0.92	1.80	1.69	34.51	235	Soft
10	2.78	2.04	0.74	1.85	2.20	35.05	235	Good
11	2.88	2.18	0.70	1.76	2.79	37.43	254	Good
12	2.80	1.77	1.03	1.83	3.15	37.18	262	Good
13	3.06	1.89	1.17	1.79	3.83	40.77	275	Very hard

*Hamasumi, *Science Reports, Tohoku Imperial Univ.*, 1924, Vol. 13, pages 133 to 178.

†Mean of two tests.

carbon slightly, reduces strength, and increases Brinell hardness (Bauer and Piwowarsky, *Stahl und Eisen*, 1920, Vol. 40, page 1300.)

Copper

SMALL amounts of copper readily enter into solution in the matrix of cast iron, but without very striking results on physical properties. Up to 2 per cent, there is a slight increase in tensile strength, transverse strength, and Brinell hardness. (Hamasumi, *Sci. Reports*, Tohoku Imperial Univ., Vol. 13, pages 133-178, and *Die Giesserei*, 1929, No. 8, page 179.) There is no noticeable effect on the carbon, but the iron appears to be more fluid. Up to 4.9 per cent copper was used. (Lupin, *Stahl und Eisen*, Vol. 20, pages 536 to 541, 558, 590.)

Investigators disagree as to the maximum solubility of copper in iron. Lupin uses 4.9 per cent, Hamasumi, 4.0 per cent (as above), while Sahmen states the limit of solubility is 3.0 per cent. (Sahmen, *Zeit für Anorg. Chemie*, 1908.)

Copper appears to confer appreciable corrosion resistance to cast iron, especially under acid conditions. Resistance reaches maximum at 1 per cent copper. (Michailoff, *Messenger of Metal Industry*, Moscow, 1926-9-10, 5-22.)

Lead and Magnesium

IT has been repeatedly attempted to alloy small amounts of lead with iron, but without success, as lead and iron are almost completely immiscible. (Isaak and Tammann, *Zeit für Anorg. Chemie*, 55, 59, 1907.)

In more recent experiments, additions of lead were apparently followed by a tendency toward higher carbides in the iron. Even in connection with copper additions, no lead could be found in the iron. (Lentze and Piwowarsky, *Dissertation Aachen*, 1928.) Where lead is accidentally introduced into the mixtures, it is completely lost. (Williams, Sims, Newhall, *Foundry*, Jan. 1, 1924, page 5.)

Little work has been published on the addition of magnesium to cast iron, although it would seem to have decided possibilities. Its introduction into the iron is accomplished by a strong reaction, as would be expected. There is little effect on physical properties, but the iron is left decidedly harder. (Piwowarsky, *Hochwertiger Grauguss*, 1929, page 286.)

Manganese

THE effect of manganese in proportions ordinarily found in cast iron is so well understood that it is not considered an alloy. However, when manganese

is found in proportions over 1 per cent, it may be thought of as an alloying element.

There is a firmly rooted belief that manganese, say above 0.75 per cent, is a drastic hardener of gray iron, but in ordinary irons this belief does not seem well founded. Coe made a series of bars with manganese from 0.55 to 30 per cent, finding no great reduction in graphite until manganese was over 3 per cent. (Coe,

Journal, Iron and Steel Inst., No. 2, 1910.) Hamasumi found little difference in combined carbon until manganese was over 3 per cent, although Brinell hardness increased steadily. (Hamasumi, *Science Reports*, Tohoku Imperial Univ., 1924, Vol. 13, pages 133-178.)

Other investigators added manganese to gray iron, up to 2.5 per cent, finding little effect on tensile strength, deflection, or hardness. (Wüst and Meissner, *Ferrum*, Vol. 2,

Jan. 8, 1924, page 97.) The effect of manganese on the iron carbon system has been studied by Wüst. (Wüst, *Metallurgie*, Vol. 6, Jan. 8, 1909, page 3.)

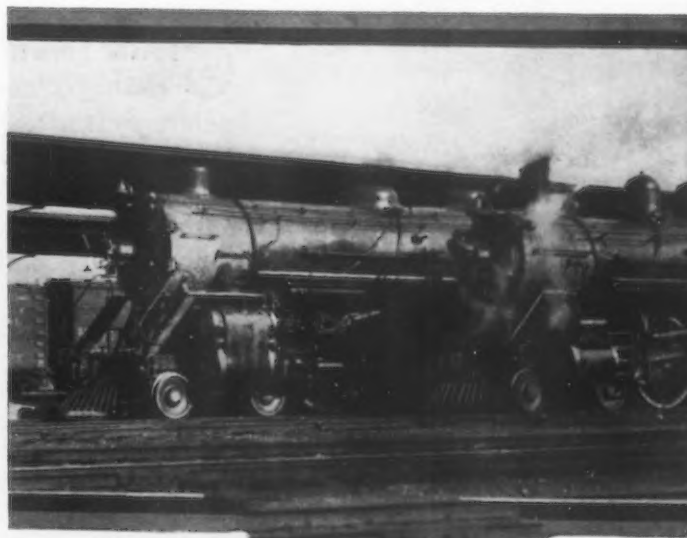
Keep, in his book on "Cast Iron," and also T. D. West, have published the results of numerous practical experiments on the effects of manganese on cast iron. (Hatfield, "Cast Iron in the Light of Recent Research," page 93.) The effects of manganese up to 18 per cent have been recently reported. (Krivobok, Report Carnegie Inst. and Bur. Mines. *Foundry Trade Jour.* Dec. 13, 1928, page 428.)

Molybdenum

IN general, molybdenum acts as a strengthener and hardener of gray iron. It produces a fine grain, and resistance to wear, the graphitic carbon taking characteristic hook or whorl forms. Investigators found decided increase in tensile and transverse strength with little reduction in machinability, with 0.5 per cent molybdenum. (Piwowarsky, *Stahl und Eisen*, Feb. 26, 1925, page 289; Smalley, *Foundry Trade Jour.*, Dec. 31, 1922, Jan. 4, 1923, and Smith and Aufderhaar, *THE IRON AGE*, Dec. 5, 1929, page 1507.) Molybdenum has been successfully used in rolls, and where wear resistance is important. (Anderson, *THE IRON AGE*, Jan. 1, 1925, page 65.)

Molybdenum can be obtained as ferromolybdenum (62 per cent). In the crushed form, it is readily soluble in gray iron. Where wear resistance and strength are desired, this alloy will probably find an enlarged field. Recent work on molybdenum gives promise of combining the remarkable strength properties of molybdenum with those of other alloys.

(To be concluded)



Alloy iron castings important in locomotives



A. PHILLIPS

EXPERIMENTS with steel containing 28 per cent chromium and 0.25 per cent carbon leads to the conclusion that steel of this composition is subject to relatively rapid grain growth at the lower temperatures, 1290 to 1830 deg. Fahr. and to extremely rapid growth at higher temperatures, 1830 to 2550 deg. Fahr., according to a paper "Grain Growth in High-Chromium Heat-Resisting Steel," delivered at the National Metal Congress in Chicago this fall, by Arthur Phillips, associate professor of metallurgy, Yale University, and Ralph W. Baker, research metallurgist, Republic Steel Corporation. Furthermore, the grains approach the maximum size after comparatively short periods at elevated temperatures. This observation regarding the rapid grain growth of this alloy is in agreement with the experience of the mill operators who report that it develops extremely coarse grain during short annealing periods at moderately high temperatures. In processing the anneal it is important, therefore, to use the lowest effective temperature in order to avoid the brittleness associated with the coarse-grained structure.

For the grain growth work, a 5-lb. ingot of the following composition was prepared: Chromium 27.82 per cent, carbon 0.26 per cent, silicon 0.34 per cent, manganese 0.39 per cent. It was melted in a 35-kilovolt-ampere high-frequency induction furnace, using Armco iron and low-carbon ferrochromium as the base materials. After homogenizing the casting by annealing for several hours at 1650 deg. Fahr., followed by furnace cooling, seven pieces were cut from the central part of the ingot. Each specimen was then given a 20 per cent reduction of thickness by cold working.

One specimen was used for each of the temperatures chosen for the annealing schedule. After annealing at a given temperature for 4 hr. the sample was furnace cooled, ground and polished, and a grain count made. It was then annealed for another 4 hr. at the same temperature and a second grain

Grain Growth

GRAIN growth in certain types of the high chrome-irons at high temperatures is often the cause of serious trouble. This paper offers the results of certain investigations on some types of these alloy steels. It is demonstrated that some such steels are subject to

count obtained. This procedure was followed until each specimen had been annealed for a total time of 20 hr. In other words, this method permitted the examination and grain count of each specimen for cumulative annealing period up to and including 20 hr.

How the Grains Were Counted

The grain counts were obtained by counting every grain included within a rectangular area, $3\frac{1}{4} \times 4\frac{1}{4}$ in., outlined on a ground glass plate. With the exception of the specimen annealed at the highest temperature, a magnification of 100 dia. was used. In the case of the extremely coarse-grained structures, a magnification of 10 dia. was employed and the counts so obtained were evaluated in terms of the higher magnification. It was noticed that the structures resulting from the prolonged annealing were free from austenite only by virtue of considerable decarburization produced by the several hours at elevated temperatures.

Work of Other Investigators Checked

Other investigators in studies of iron-chromium-carbon alloys found austenite in quenched samples

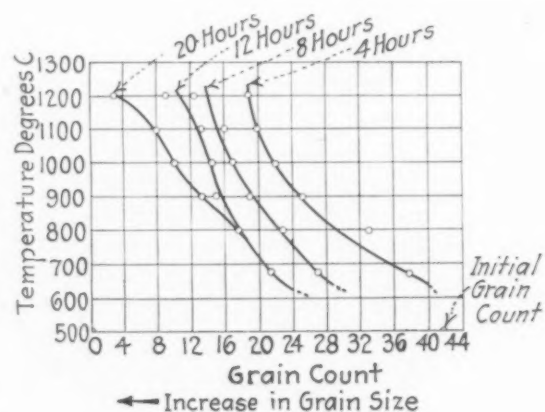


Fig. 3—Grain count curve

in the Chrome-Irons

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relatively rapid growth at the lower temperatures and to extremely rapid growth at higher temperatures. Extremely coarse structure is responsible for brittleness, whether from heat treatment, or in rolling, or in service.

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of 28 per cent chromium steel containing 0.32 per cent carbon. In order to obtain further information on this point the authors melted, in the high-frequency furnace, three 5-lb. heats of the following composition:

	No. 1, Per Cent	No. 2, Per Cent	No. 3, Per Cent
Carbon	0.15	0.19	0.27
Chromium	28.81	27.00	27.82
Silicon	0.45	0.34	0.34
Manganese	0.40	0.38	0.39

After the castings had been homogenized, specimens $1 \times \frac{1}{2} \times \frac{3}{16}$ in. were cut from the central portions of the castings. Pieces $\frac{3}{16}$ in. thick were selected, instead of the thinner strips used by other investigators, in order to minimize and to determine the extent of decarburization associated with the heating of this alloy at high temperatures. Preliminary work indicated that the treatment of thin strips led to chemical alterations of a serious nature. It is fortunate in this connection that the phase transformations in this alloy are so sluggish as to permit the use of reasonably thick specimens.

One specimen of each composition was quenched in water after heating for 2 hr. at the following temperatures, 2100, 2280, 2370, 2460, 2570 and 2640 deg.

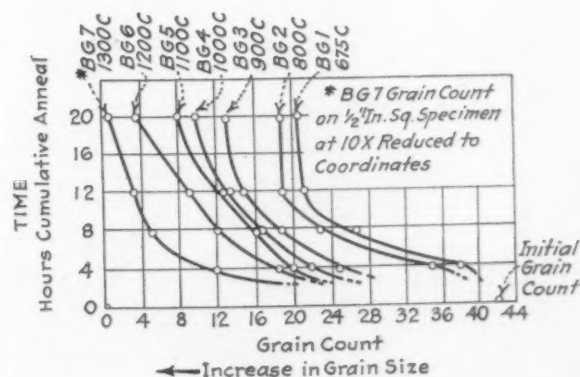


Fig. 4—Grain count curve



R. W. BAKER

Fahr., requiring a total of 18 specimens. Pieces from the three castings were heated together at each common temperature. In all cases, the steel was heated slowly to the desired temperature and then held at that temperature for the time specified. The heat treatments were carried on in a tightly sealed platinum-wound resistance furnace, the atmosphere of which approached as near a neutral atmosphere as may be conveniently realized.

Examination disclosed that a film of oxide covered the specimens quenched from the lower temperatures. Specimens heated to the higher temperatures, however, were covered by a scale approximately 0.02 in. thick. The scale and decarburized under-surface were removed from all surfaces of the pieces. In general, the samples for chemical analysis and structural studies contained carbon contents equal to those of the same specimens prior to the heat treatment.

Austenite Found in All Specimens

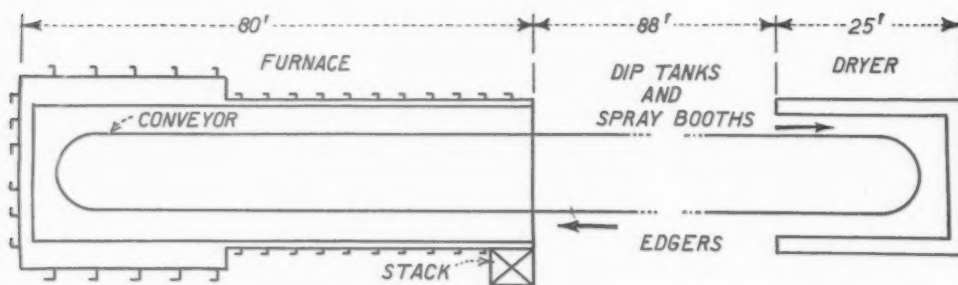
In all the specimens the presence of austenite in varying amounts was observed. In the case of the steels quenched from the lower temperatures, a large amount of the austenite was retained in the form of broad grain boundaries and spherical intergrain globules. In the specimens quenched from the higher temperatures, a small amount of austenite was visible in the form of thinner grain boundaries and smaller intergrain globules. The pieces heated at 2640 deg. Fahr. showed evidences of liquefied metal. Supplementary examinations of specimens subjected to the prolonged anneals, referred to in the grain growth experiments, disclosed a surface free from austenite.

The experimental results of this study confirm the belief of Bain and others that carbon is soluble to an appreciable extent in delta iron, and since alpha iron at elevated temperatures becomes delta iron, it is evident that the solubility of carbon in

(Concluded on page 1665)



Girls transferring work to and from conveyor and edgers. The edging tables are at extreme left. Conveyor lines are supported by overhead framework.



Layout of furnace and dryer, with respect to dip tanks, spray booths and edgers, at plant of Detroit Michigan Stove Co.

Spraying work (below) and hanging it on conveyor, which can be seen passing in and out of dryer, at right.



Vitreous Enameling Process

Is Semi-Automatic

By J. B. NEALEY

American Gas Association, New York

CONTINUOUS and automatic enameling furnaces, with traveling conveyors projecting from either or both ends, and about which are located the dip tanks, spray booths, edgers, etc., have completely changed the process of vitreous enameling iron and steel products. A new unit of this kind has been installed in the plant of the Detroit Michigan Stove Co., Detroit, where it supplanted seven periodic-type furnaces. The installation is so flexible that it can be adapted to almost any kind of enameling, and is now doing 95 per cent of the work of the plant on steel.

This department is run on a two-shift basis, the ground coat being applied and burned at night and the white coats by day. Dip tanks on wheels are rolled into position along the outside of the moving conveyor. Operators dip the stove parts and place them on the tools suspended from the conveyor. The work is carried through the drying oven and then through the length of the furnace, where it makes a complete turn and travels back, to be picked off just before reaching the point from which it started.

The following shift rolls the dip tanks out of the way and places the spraying and edging units on opposite sides of the conveyor. The parts are sprayed and hung on one side of the conveyor, which takes them into the drying oven. Here the conveyor makes a complete turn and brings them out on the side opposite where they were first hung on. The operators then remove the work, edge or brush the edges and return them to the conveyor which carries them through the furnaces and return, completely vitrified.

Furnace and drying oven are set opposite each other, as shown in diagram. The loop conveyor makes a complete turn in the further end of each. There is considerable space between the two units for loading and unloading. As the parts with the first white coat emerge from the furnace they are removed and dipped for the second white coat and then hung back on the conveyor. From one to four coats are used at this plant.

The furnace is 80 ft. long, and the dryer 25 ft. The overhead chain conveyor is operated by a motor-driven sprocket at the back end of the dryer, and held in suspension by an idler at the back end of the furnace. The distance between these two sprockets is 193 ft., leaving 88 ft. of double conveyor chain free between the two units, for loading and unloading. A 2-hp. motor drives the conveyor through speed-reduction gears, which permit a wide range in burning time.

Of the muffle type, the furnace is 16 ft. wide and 4 ft. high, inside dimensions, and is built of brick, steel incased. The heating chamber, roughly the back half of the furnace, is 2 ft. wider, while the walls are of firebrick and have 2 ft. of insulation added. The remaining wall sections are thinner by 6 in. Vertical channels along the sides of the furnace support the roof and conveyor.

Heat is supplied through ten gas burners, located in the heating chamber portion, five firing from each side. These fire into a muffle under the hearth and the products of combustion from this muffle pass out into a stack through a duct.

Proper temperature is automatically maintained

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USING an endless conveyor, one end of which is in the burning furnace, while the other is in the dryer, a company making gas stoves has solved many problems in connection with operating its enameling plant at low cost and producing a uniform product. The space between furnace and dryer, which are in line with each other, is used for dipping, spraying and edging, the equipment for these purposes being movable and handled in and out between working shifts.

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through three thermocouples within the furnace, which are wired to an automatic temperature control. One couple is located at the back end and the other two at the entrance and exit portions of the heating chamber respectively. The valves on the gas supply lines are motor-operated and a chart of the heat fluctuations is kept by means of a recording pyrometer.

The furnace is thus divided into two zones, pre-heating and heating. Its design is of the counter-flow order, i.e., the outgoing hot work imparts some of its heat to the coming cold work, as they pass parallel to each other and in opposite directions.

The chain conveyor runs just above the roof of the furnace, the carrying fixtures hanging from it at intervals of 3 ft. The shanks of these travel through slots in the roof. Narrow metal strips on these fixtures ride on two metal bands on the roof, one each side of the slot. These effectively seal the furnace.

Gas is premixed with air for complete combustion and proper furnace atmosphere, and this mixture is delivered to the burners under pressure. The heating chamber of the furnace is maintained at approximately 1600 deg. Fahr. The speed of the conveyor is so regulated that the ground coat remains in the furnace about 11 min., while the white coats are allowed only 3 min. and their highest temperature is 1400 deg. Fahr. The dryer is kept at 600 deg. Fahr.

A sheet steel chamber is placed at the point where the hot work emerges from the furnace. Here considerable hot air is collected and blown, through a duct, into the dryer, which is partially warmed by this waste heat. Adjoining this chamber is a hood and more warm air is removed by suction, which helps

to cool the work so that it can be handled by the operators.

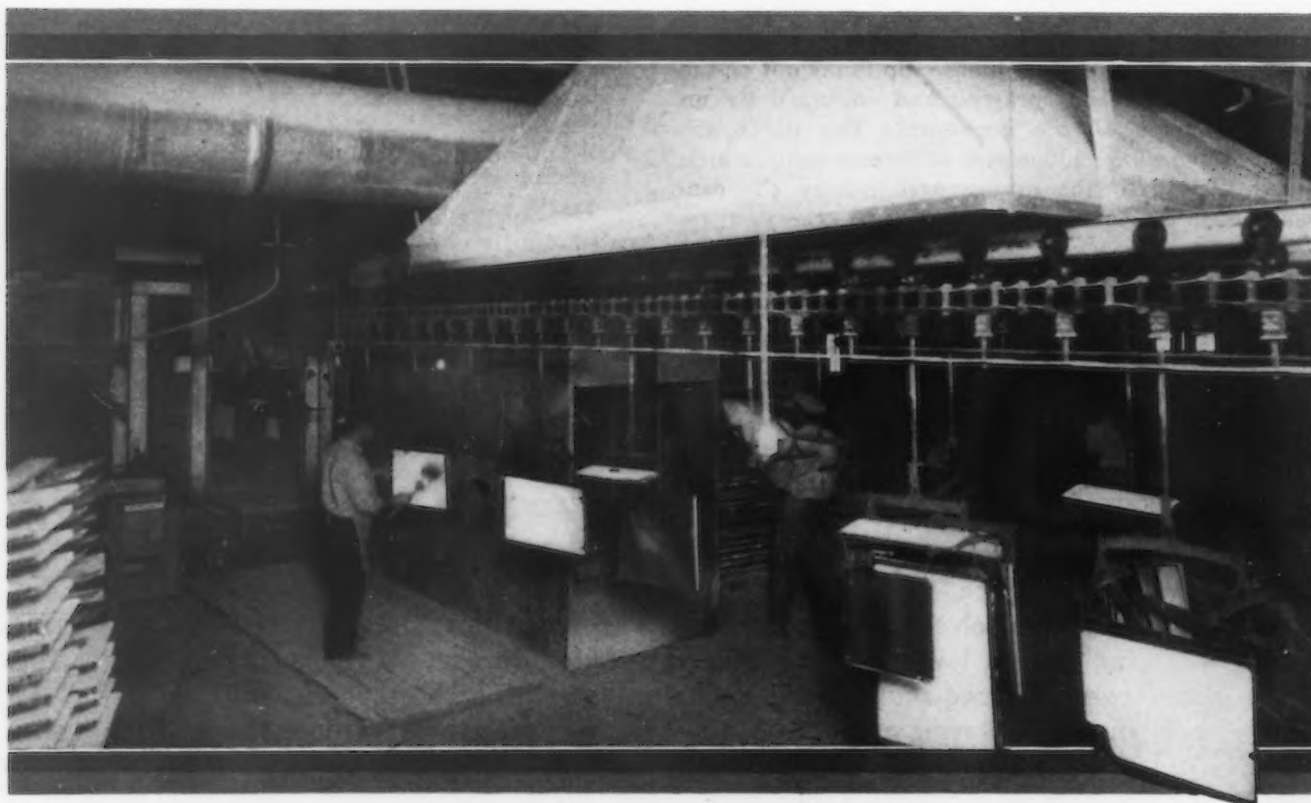
The dryer is also of sheet metal, insulated to a depth of 3 in. It is 25 ft. long and 9 ft. high. The main heat supply for this unit comes from a long gas pipe burner laid close to the floor.

Each spray unit consists of a three-rope, motor-operated, traveling conveyor about 20 ft. long, which runs through a spray booth. One operator places the stove parts on the conveyor, another puts the enamel on under pressure and the third removes the parts and hangs them on the furnace conveyor.

The process of edging is speeded up by the use of unique round tables of light weight which can be revolved by hand. The brushes with their wheels are located close to these tables, but on the side away from the conveyor. Operators remove the parts as they emerge from the drying oven, place them on the tables and revolve them to within easy reach of the edgers, who brush the white coat from the edges, leaving the black ground coat exposed. They then return them to the tables so that the other operator can replace them on the conveyor.

For putting on the white coats the crew consists of 42 operators, while that employed on the ground coat process totals only 18. Approximately 50,000 sq. ft. of white coat can be burned on daily, with a gas consumption of about 10,000 cu. ft.

This concern also applies and burns enamel to cast iron, by the wet process. Here the first coat is sprayed on wet, air dried and then burned in a furnace at 1200 deg. F. for from 15 to 20 min. The work is then removed, the second coat sprayed on wet, and dried and burned on with the same temperature and time period.



Work entering and emerging from furnace. Sheet steel chamber and hood gather heated air from the outgoing work and this is blown into the dryer.



Die-Casting Plant Laid Out on Engineering Basis

By **SIDNEY G. KOON**

Associate Editor, *THE IRON AGE*, New York

MANY interesting problems in the design of a plant for the die-casting industry came up for solution when the Allied Die Casting Corporation, Long Island City, put up its new building a year ago. Efficient grouping of departments so that control of operations was easy, inexpensive handling of materials, avoidance of crossed lines of movement, ventilation—of particular importance in both foundry and die-casting departments—heating, lighting, conservation of water and many other items had to be considered.

Each of these was taken up, not only by itself, but in its relation to the entire layout. The resulting plant is perhaps one of the best arranged and equipped which can be found.

Engineering Is Heart of System

FOUR floors, with daylight all around, comprise the plant. The heart of the operation lies in the engineering department, at the eastern end of the third floor. Die-casting is preeminently an engineering proposition. A high type of engineering is required in the design of the dies and in the design of the machines which use these dies in producing the castings. All of this work is done here, and the casting machines themselves are made right in the plant.

Immediately to the north of the engineering department is the die-making room, with heat-treating department adjoining. This combined unit occupies about one-fifth of the total floor space in the plant. Immediately above the engineering department and occupying most of the fourth floor is the die-casting room. Immediately below the engineering department is the trimming and finishing department, again using dies and requiring close engineering supervision.

Similarly with handling of materials. The die storage in the basement is closely adjacent to the freight elevator, which is in almost the geographical center of the building. Dies are removed from their racks by means of an elevating truck, are carried to the elevator and quickly delivered to the machine where needed. The location of the freight elevator at so central a point means that the average haul is a minimum. It means also the smallest possible amount of cross hauls in taking material from one place to another.

Closely adjacent to this elevator is a vertical pipe shaft, fully inclosed, with two access doors on each floor, in which all piping for all floors traverses the building from top to bottom. This includes air pipe, gas pipe, oil pipe, steam pipe and water pipe, and in the case of air there are two sets of piping, for differing air pressures.

This element of accessibility and short movement is carried out in the relation between the tool makers' benches and their machines. Each bench has two electric outlet plugs and a flexible lamp bracket. The lathe or other machine on which the man is working is immediately back of him when he works at the bench, and only a step away.

Die storage is worked out on a common-sense system, upon racks of heavy oak shelving set in steel frames located in the basement. Successive stands of racks are labeled "A, B, C," etc. Each section of rack between the supporting steel members has a number and each shelf has another number. Thus, by means of one letter and two digits the location of every die is indicated on the cards kept in the foreman's office.

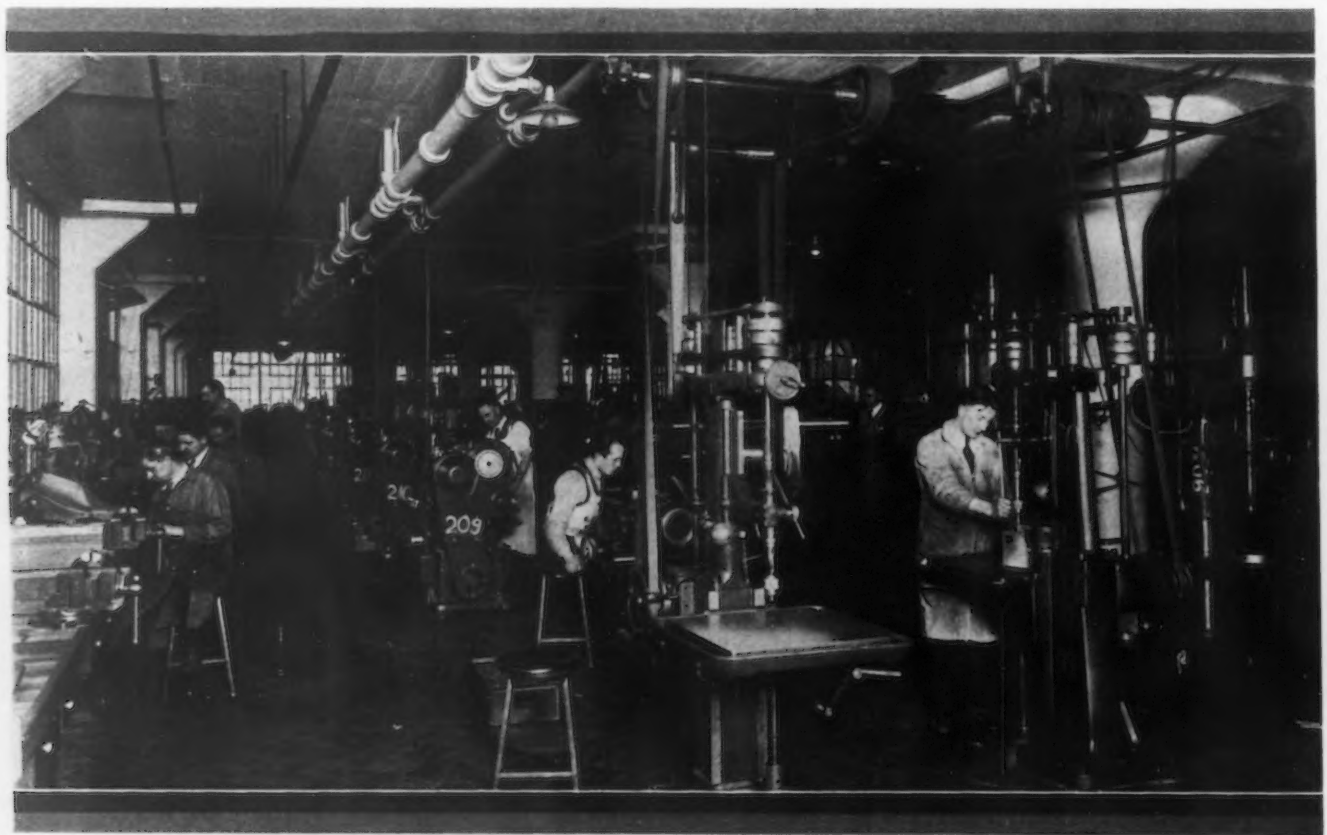
There is space between the steel supports on these racks for about four or five dies. Each die has its



MACHINES in casting room, showing splash guards and long "safety" operating handles. Ventilating duct appears at top, carrying away the exhaust gases. General room ventilation is aided by the large windows, which also furnish ample light.



IE-MAKING department. This occupies a large part of one entire floor in the four-story building. Wood blocks set in mastic are used for flooring, for the double purpose of minimizing vibration and making it easy to install or move machines.



number painted upon it in large white figures. From the card the man getting the die can locate immediately which section of shelf it is on. He has then only to select from among, say, four dies on that shelf the one called for and transfer it to the die-casting room.

Providing Suitable Working Conditions

NATURAL ventilation is depended upon in large measure in taking care of heat generated in the die-casting room. Skylights of generous size, 20 or 30 ft. in from the outer wall of the building, receive and dispose of heat carried to them by natural flow from the windows alongside the machines. For taking care of the fumes and hot gases from the melting pots in the machines, however, an exhaust system is operated. There are two fans at convenient locations, each fan handling the exhaust from a considerable battery of machines and discharging it through the roof.

A central station for compressors for air and gas and pumps for oil is maintained on the first floor. Here is an oil pump running at a pressure of 1000 lb. to the square inch, and governing its pressure by means of an accumulator to take up pulsations. This pressure is used to hold the dies in position during casting. In this same central station are air compressors giving the 450-lb. pressure used in injecting metal into the die, and 100-lb. pressure used for cleaning the dies and for other purposes. A gas compressor puts a 10-lb. pressure on the gas mains which are led to the various furnaces, including both the melting furnaces in the foundry and the pots at the base of each die-casting machine.

Much water cooling is employed in the plant. A

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CENTERING around the engineering department, which is the heart of the whole system, the plant described here has grouped the different departments in such a manner as to render them easily accessible from one to the other. At the same time many factors entering into a modern industrial plant were studied and the problems solved in connection with the erection of this unit. The article shows what some of these problems were, how they were attacked and how well they were met.

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cooling tower 70 ft. high, erected upon the roof, has paid good dividends upon its cost through cutting down the monthly water bill to a mere fraction of what it otherwise would be. This tower, by the way, will give water only 5 deg. above the wet bulb thermometer reading on the hottest day in summer.

Water is used to cool the compressors on the first floor. Water is circulated through the die-casting dies

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POURING alloy into water-cooled reversible mold. On page 1593 the operator is using a band saw to trim gates from a die-casting.



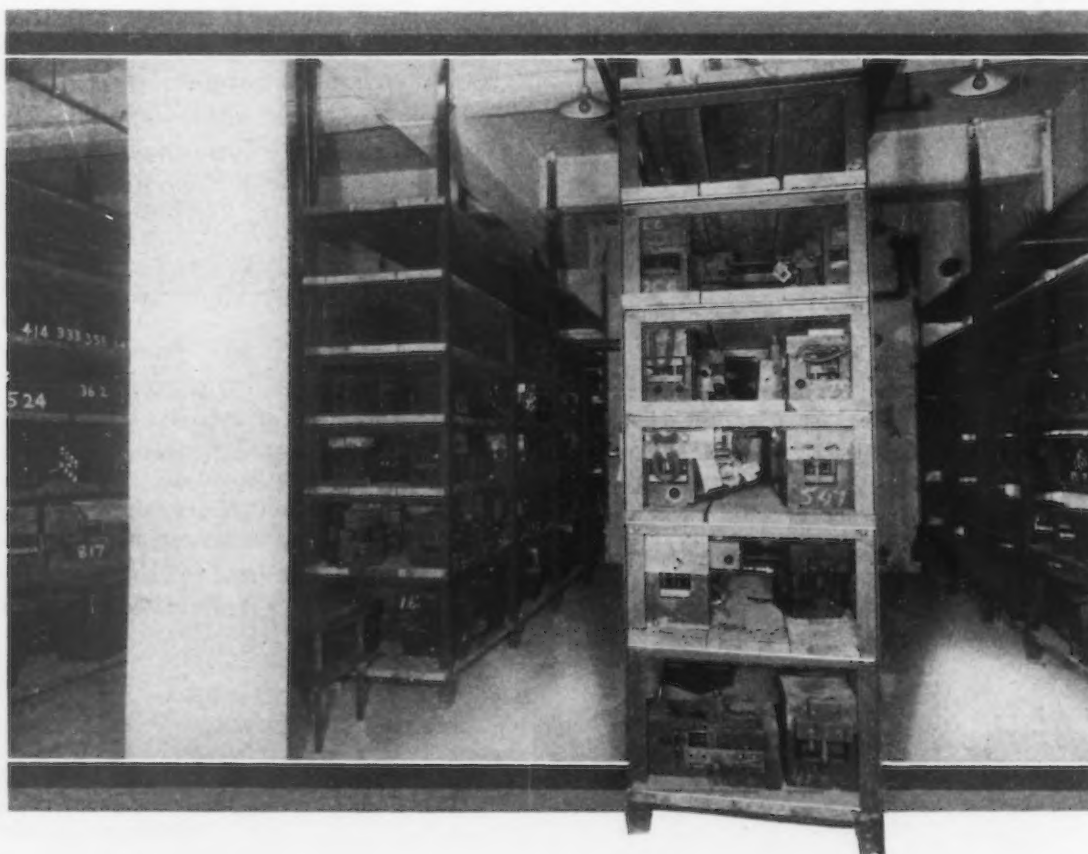
on the machines. Water is used to cool the molds in which the alloy ingots are made. All this water is in a closed system, so to speak, and the only industrial water required from day to day is the make-up to take care of evaporation, leaks, spray blowing away from the cooling tower and other minor losses.

Heating of the building is accomplished very satisfactorily by unit heaters suspended from the ceilings of the various departments. This is under good control, steam heat for these heaters being supplied by means of an oil-burning boiler in the basement. Along-

department during the following day. This specifies what each machine is to do and goes into such details as description of the die, what the particular alloy is which is to be cast in the die, how many are to be made, and other pertinent facts regarding the order. Thus, he is fully competent to run his department at its economical best, without having to worry about the added factor of routing work and seeing to it that machines are kept busy.

Considerable new equipment was purchased at the time the new plant was occupied. All the new machines

PATTERNS are stored on numbered racks and shelves. The locations are completely specified on the order cards, making it easy to get the die wanted.



side this boiler is the pump which elevates water to the cooling tower, drawing it from the tank into which this water drains after passing through the various cooling operations in the manufacturing processes.

Definite Production Control Installed

ALMOST without exception the features mentioned above were new in the new building. There were other new features introduced, however, entirely aside from these physical factors. Previously there was no controlled planning of operations. Orders were put through pretty much as they came in, and machines were loaded in accordance with the foreman's judgment.

Today all this is changed. The production control department makes use of two visual charts on the walls, one of which shows at a glance the location and progress of every live order on the books, while the other shows, also visually, what each machine is doing at the moment and how long it is dated up.

Every day about 4 p. m. the foreman of each department receives a schedule of the work ahead for his

are individually motor driven. Of course, many of the old machines had this characteristic, also, but it was not universal, as is the new practice.

Flooring and Machine Foundations

ANOTHER development in the new plant lies in the flooring in the die-making department and placement of machinery everywhere, but particularly where vibration would be a serious factor. The die-making department has a floor of wood blocks set in a base of cold mastic on the concrete floor slab. This mastic is plastic, which makes it easy to remove parts of the floor at any time for the purpose of installing new machinery.

The blocks are not fastened down in any way. At the same time, there is enough suction to the mastic so that the floor keeps in good surface condition without attention. The wood blocks do not abut the concrete walls. They are separated from the walls by a 1/2-in. layer of the mastic, so that vibration elsewhere in the building cannot affect the floor in this room and to allow for expansion and contraction. This form of

floor was adopted for this room for the double reason of avoiding vibration and easing the conditions underfoot for the men working on it.

Foundation emplacements for machinery, particularly for such machinery as the compressors in the central station on the first floor, consist of a sand bottom with cork filling all around, to absorb such vibration as the machines make and prevent it from being transmitted to the building structure. In some cases, foundations have been laid out for future machinery. In every such case it is in this same manner of avoiding, by all possible means, the incidence of vibration transmitted to operating departments.

Control of heating of the 18 pots in the die-casting room is centralized in a battery of Brown Instrument Co. indicating recorders. This pyrometric control maintains a temperature within about 10 deg. Fahr. of that called for by specifications. Machines casting aluminum alloys are being maintained at about 1400 deg., while those casting zinc are run at about 800 deg. Approximately one-third the dollar volume of work going through is aluminum and its alloys, the remainder being zinc and zinc alloys.

Factors of Safety Carefully Worked Out

OIL at 1000 lb. per sq. in. operates the hydraulic ram, pressing one half of the die up against the other half. Air, at about 450 lb. pressure, forces the metal from the container through a jet and into the die. The factor of safety holding the two halves of the die to the work may be roughly estimated as the ratio between these two pressures, or about $2\frac{1}{2}$ to 1.

Each die is water cooled in both halves. Air pressure at about 100 lb. is used in cleaning the dies, on such occasions as they do not clean themselves when the casting is stripped from them.

Safety devices have been so well thought out that there have been only three lost-time accidents in the last six months. Perhaps the most dangerous work in the plant is that around the die-casting machines themselves. There are splash and spray guards between machines and in front of machines, so that drops of molten metal accidentally thrown out at any time by the heavy pressures exerted will fall harmlessly. The lever by means of which the operator releases the air pressure back of the metal jet is so far away from the place where molten metal flows, and in such a direction from that place, that the operator is in no position to be hit by any of these missiles.

An interesting kink was seen in the foundry, where the alloys are cast into small pigs or ingots in a water-cooled mold. Each one of the three melting furnaces has two mold stands in front of it, the operator working between the two. These molds are reversible, having capacity for about 20 of the small pigs on each side. They are made of cast iron and are given a daily French chalk wash to prevent the metal from sticking.

The procedure here is for the operator to fill the mold on one side, thus making about 20 pigs. He then fills the mold on the other side of his working position, by which time the first lot will have cooled sufficiently to be dumped. That mold is then turned over—it is swivelled on a central axis—thus exposing its other side to the third pouring of pigs. Thereupon the second mold is dumped and its heretofore unused side receives the fourth lot of pigs. This

procedure is carried on from one mold to the other indefinitely, as the water keeps the molds cool enough for this treatment.

Alloys are melted under a careful grade control in oil-fired furnaces, with pots carrying about one ton of metal. Waste gases from the oil burners and fumes from the pots are drawn off through the hood at the top, and carried by means of fans to the outer air above the roof, in the same manner as the exhaust from the die-casting machines on the top floor is handled.

Making its own die-casting machines to its own designs, the company has on the first floor a fully equipped machine shop for this purpose. This gives at the same time an opportunity for doing such maintenance work as is required throughout the plant. Manufacture of the die-casting machines furnishes a certain backlog whereby the machine shop may be kept running at a fairly uniform rate. Some of these die-casting machines are made for sale, under certain conditions.

CREATION of a spot of heat calculated to be 900,000 deg. Fahr., or approximately 90 times as hot as the sun, is demonstrated by Dr. J. Slepian of the Westinghouse Research Laboratories, East Pittsburgh. The spot, believed to be the hottest in the universe, is created electrically in a nearly perfect vacuum. It was developed by Ragnar Tanberg while investigating the characteristics of electric arcs in a vacuum. No thermometer exists which will measure so high a temperature directly. It is calculated by measuring the velocity of the molecules of the electrode metal, which has been "boiled away" by the intense heat.





Successful Machine Polishing of Metals and Metal Products

VARIABLES such as the material; condition of the original surface and condition desired in the final surface of the work; the type, material, density and cushion of the polishing wheel; the kind and grain size of the abrasive and the peripheral speed of the polishing wheel; the speed and pressure on wheel and machine vibration are among the most important factors on which depend the success of machine polishing. It is important to provide oscillation in either the work or the polishing wheel in order to avoid straight line polishing marks on the surface. This was discussed by Robert T. Kent, Divine Brothers, Utica, N. Y., in a paper "Success of Machine Polishing Depends on Several Variables" at the National Metal Congress in Chicago this fall.

A General Rule Difficult to State

It is difficult to lay down any general rule covering the economics of machine polishing. Nevertheless, where the machine is adapted to the work and hand operations can be eliminated and where there is sufficient production to keep the machine busy a fair proportion of the working day, machine polishing will usually prove economical.

It must be recognized at the offset that all variables are more or less interrelated. For instance, the character of the material will determine the character of abrasive. Then, too, the condition of the original surface influences the size of the abrasive grain that is to be employed. The contour of the work will influence the selection of the type of wheel, as for instance, a plain surface calls for a hard, somewhat rigid wheel. Work that has a curved contour calls for a softer, flexible wheel that will fit itself to the surface to be polished. The degree of finish to be obtained also influences the speed of the work past the polishing wheel—the slower the speed of the work passing the wheel the better will be the finish. The material of which the work is composed determines the character of the abrasive that must be used.

What Various Metals Require

Steel and brass require sharp cutting edges to be continuously presented to the work. The abra-

sive, therefore, should fracture in such manner and along such fracture planes, as to form cutting edges that are always of the same character. An abrasive that fractures in such a manner as to cause splinters and slivers will prove unsuitable as these splinters will put scratches in the work that will later have to be removed.

In soft cast iron, the sharp cutting grains tend to dig the iron particles out of the softer carbon matrix and to roll them along the work under the wheel. A solution is found in the use of an abrasive that will crush instead of fracture it. Turkish emery has been found satisfactory when working on aluminum, duralumin and copper. Alundum is satisfactory on steel and brass and crystolon may be used for polishing cast iron.

Brass requires several times the horsepower that steel does. Other materials require still different amounts of power. Although research has not yet progressed to the point where it can be stated definitely what power is required over a certain range of conditions to polish the different materials, it can be stated with certainty that the size of the motor in a hand lathe that will produce the desired finish is absolutely no criterion of the size of motor that should be installed in the polishing machine.

Effect of Mill Scale and Pits

Mill scale is hard and difficult for the polishing wheel to break. Furthermore, it will clog the wheel and render it ineffective in a short time. Deep pits require that the polishing wheels remove all the surface metal down to the bottom of the deepest pit and may impose a wholly unnecessary burden on the wheel. Tumbling or pickling may improve both of these adverse conditions but, if not carefully done, may enhance the difficulty. The surface may be ground or it may be machine finished. In either event, the polishing wheel must first remove the metal down to the bottom of the deepest grinding scratch or deepest tool mark.

It is axiomatic that the polishing wheel will work best on a clean, uniform surface. It follows then that the better the original surface, the lower will be the investment in machinery, in pol-

ishing wheels, and the lower will be the labor cost of the polishing operation.

Condition of the final surface of the work dictates both the number and character of polishing wheels that must be used in the machine. Color and the dimensional characteristics of the work itself are several points to be considered. Quite frequently work that is susceptible to machine polishing in all other respects presents considerable difficulty, for the reason that its contour is such that the polishing wheel will round edges as it passes over them, or drag the edges of drilled holes until the holes are elliptical.

Proper selection of the wheel may obviate some of these difficulties. A change in the design of fixture may eliminate others. A change in the direction or rotation of the wheel quite frequently offers a solution. If each wheel be made to trail over the edges with which it comes in contact, it is possible to hold the edges square and sharp. Close tolerances call for extreme care in setting up the wheel and making it truly symmetrical at operating speed. The wheel should be of hard density, for a soft wheel will flex on the work and thereby cause lack of uniformity in the contour of the surface polish.

Wheels Should Be Trued at Speed Used

It is an easy matter to make a wheel truly cylindrical when truing it up in the lathe, preparatory to applying abrasive head. However, it should be borne in mind that, in the ordinary wheel-dressing machine or engine lathe, which is sometimes used for the purpose of truing wheels, the speed of rotation is relatively low. When in operation the polishing wheel rotates at from 1800 to 2500 r.p.m. depending upon the diameter. The wheel will become distorted at these high speeds and the surface that comes in contact with the work is no longer cylindrical. To correct this condition, wheels should be trued at the same speed at which they are to be used.

Many manufacturers, even today, have the idea that a buff is a buff, and a polishing wheel is simply a collection of buffs edge-glued together. To illustrate the fallacy of this idea, it is only necessary to state that light different grades of cloth are used in the manufacture of buffs which enter into polishing wheels. Every one of these grades is selected because it is particularly adapted to one class or another class of work. Furthermore, the buff made from these different grades of cloth may be sewed in several different ways. They may be spirally

sewed over the entire surface, at wide or narrow intervals, or they may have two or many rows of concentric sewing from the center hole out to the periphery. Each class of sewing is dictated by the character of work that the wheel is to do and a wheel that is eminently fitted for one job will prove a hopeless failure on another.

Furthermore, the various buff sections of which the clothflex wheel is composed may be glued together from the center hole clear out to the circum-

ference of the wheel, or the gluing may stop at 3 in. or 2 in., or any other distance from the circumference, depending upon the hardness of the cushion desired in the wheel. If a very soft wheel is required, the gluing may be omitted altogether, and the various cross sections hand-sewed together with two or more rows of concentric sewing.

How Polishing Machines Should Be Designed

The polishing machine should be designed, wherever possible, to maintain a constant peripheral speed of the polishing wheel as close as possible to 7500 lin. ft. per min. In general the higher the peripheral speed, the more efficient is the action of the abrasive. The figure of 7500 ft. is chosen because this speed is about the maximum at which the glue holding the abrasive to the surface of the wheel will maintain its strength under the action of the heat generated by the operation of the wheel upon

the work. An increase in the speed of the wheel would increase the efficiency of the cutting momentarily. It would, however, generate sufficient heat to soften the glue, thereby permitting the abrasive to be torn from the wheel before it had rendered its full service as a cutting medium.

Cutting speed below 7500 ft. per min. results in decreased cutting action of the abrasive and a longer time is required for removal of a given amount of metal. Speeds that may be entirely safe from the standpoint of the wheel may be ruinous to the work, for the reason that the heat generated will have adverse effects upon the metal of which the work is composed. Some metals undergo distinct changes in temper and hardness as the result of the heat generated by excessive wheel speed.

The polishing wheel, when correctly built and properly maintained, should not decrease appreciably in diameter with use. The wheel should never be operated after the abrasive head has been worn through to the fabric of which the wheel is com-

(Concluded on page 1665)

POLISHING metals by means of machinery has its problems. The polishing of rustless steels is among recent ones to introduce difficulties. Robert T. Kent, in the accompanying article, takes up at some length the various factors which must receive consideration and states these limitations, as for example: Peripheral speed of the polishing wheels should be held as closely as possible to 7500 lin. ft. per min.; different jobs require different depths of cushion and different wheel densities; too much cushion may tend to set up vibration in the polishing wheel and vibration produces chatter marks in the article polished.

Effects of Ford's Wage Policies Upon European Industrial Conditions

By CHARLES M. MILLS

Formerly assistant to president, Standard Oil Co. of Ohio,
and also formerly of Industrial Relations Counsellors,
New York

ADOPTION of the Ford Motor Co.'s wage plan in its European plants probably will not seriously upset prevailing labor markets abroad, but may prove to be a disturbing factor in further trade agreements. The main thing from the European point of view is that Europeans say they are capable of paying wages as they see fit without the superimposition of American wage policies.

Last spring it was announced that the Ford Motor Co. would pay the same basic wages relative to the cost of living in each of its foreign plants, providing the results of an investigation carried on by representatives of the International Labor Office at Geneva proved satisfactory. The facts behind this announcement, the difficulties encountered by the investigators and the effect of the adoption of this policy upon industrial conditions are particularly far-reaching in importance.

Sir Percival Perry, managing director of Ford's European plants centered at the London office, became interested in the comparative indices of wages published monthly in the *International Labor Review* at Geneva. He desired to find out if there could be a practical application of these rates to the wage scales in the seventeen Ford plants located in London, Manchester, Cork, Antwerp, Paris, Marseilles, Trieste, Genoa, Frankfurt, Berlin, Barcelona, Constantinople, Warsaw, Helsingfors, Stockholm, Copenhagen and Rotterdam. Inquiry at the International Labor Office proved that the present data were incomplete for practical application.

Inquiry Being Completed in Foreign Cities

The news of this dilemma was flashed in a cable to the United States. Edward A. Filene of Boston, who had already given considerable sums to the International Institute of Scientific Management at Geneva, cabled a sum to underwrite an investigation to be carried on by representatives of the Labor office. The offer was accepted by M. Thomas, managing director of the Labor office. The investigators came to Detroit and their findings were given to the press in June. They are now proceeding to complete the inquiry in the foreign cities that are involved.

During the summer, the writer took the opportunity to talk to various industrialists in some of the cities which are involved in the inquiry, and also to interview members of the wage commission and Ford representatives. The following conclusions may be drawn from the situation:

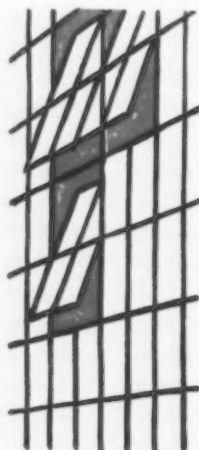
1. *The effect of the policy on Ford interests.* There is little reason to doubt that the adoption of wage scales based as accurately as possible on the cost of living should give Ford interests, potentially at least, the edge on local labor markets. The premium paid above current prevailing scales should attract the best type of labor to work in these plants. The situation is little different from that in the River Rouge or any other American plant, so far as premium wages are concerned.

Whether such wage scales will prove to be a stabilizing factor on labor turnover remains to be seen. One Ford superintendent, when interviewed, had not heard of the wage study. He stated that "they were now paying 25 to 33 1/3 per cent higher wages than other concerns in the vicinity, and the adoption of even higher scales (in his opinion) would not necessarily result in better production." The type of labor in this plant was of such character that higher wages would not prove a stimulant to greater efficiency as the "men get tired of working in one plant after a certain length of time."

2. *The effect of the policy on local interests.* In general, the adoption of the policy will probably not greatly affect local labor markets, as the number of men employed in each of the various plants is comparatively small. A few employees might be pulled away from other concerns, but a general displacement of the labor market would be almost incredible.

Furnishes Ammunition to Labor Leaders

More important, however, is the effect upon the mental and moral outlook both of industrialists and trade union leaders in the communities involved. Industrialists, in general, when interviewed, strongly resented the announced policy, as they feared dislocation of local wages, the loss of skilled workmen to Ford plants,



POSSIBLY no recent industrial development in Europe is being watched with more interest than the transplanting of the Ford Motor Co.'s American wage policy to foreign soil. With the return of better business conditions and a higher rate of employment, the real test of the plan may be expected. The author, who investigated the possible effects of the Ford plan in European countries, gives his impressions of their far-reaching importance.



and the general unsettling of present conditions. Particularly, they resented the introduction of "wages-in-relation-to-the-cost-of-living" as an additional weapon for trade unions.

"God knows the unions have enough ammunition now, without America giving them more to talk about and argue for in trade agreements," said one leader. A few of these agreements, ending in 1930, may be revised on the basis of this policy next year at the time of conference between employees and unions for new pacts. However, in reality and practically, the whole argument of the industrialists is based more on fear than on facts.

Vice-versa, the introduction of the policy will unquestionably give trade unions one more lever in trade arguments in certain centers. It will open the eyes of these leaders to the use of statistical data in arguing for increased wages with relation to the cost of living. Whether this will be worked out tangibly in the next few years remains to be seen. For example, living costs are rising in France now and from present indications will continue to increase. Agreements in the metal-working trades, as already seen at Lille, will undoubtedly be based on increasing living costs. Ford's policy opens the way to further negotiations along these lines.

3. *The effect internationally.* Is it possible to work out, with a degree of accuracy, comparative wage statistics that can be used practically in international business? Unquestionably, the fulfillment of this dream would be of great value to international corporations, not only in the setting of wage scales and international transfer of employees but also in the development of price structures and markets.

Standards of Living Different

The great trouble is that costs of living are only a reflection of standards of living. In turn, the latter have certain invisible and intangible factors that cannot be reduced to cold dollars or pounds or francs or lira or marks. The use of bathtubs and modern household sanitation is an indispensable part of the American workingman's household, yet one cannot find such ordinary comfort in the average workingman's home in France or Italy or in the Southeastern countries. Rents, in turn, in America are higher because of such comforts. How can any group of economists or industrialists work out the differential in the cost of living? Then, too, how about steam heat, high school

education for the children, the radio, and the automobile? In contrary fashion, how much is a good glass of beer or ale worth to a British or German workman in contrast to bootleg poison in Detroit or Chicago?

Further, even in discussing wages, are we sure we are talking about the same thing? Are we speaking about minimum wages, average wages, mean earnings, or maximum scales? The Germans claim their indices of wages published by the International Labor Office are basic or minimum wages, which are about 50 per cent below average wages, while the British wages, which are published, are average earnings.

Aging of Chains in Service and the Remedy

CONFLICTING recommendations for the annealing of chains to counteract aging in service induced W. Pungel (*Stahl und Eisen*, Sept. 11, 1930) to conduct a series of tensile and bend tests on the members of wrought iron and steel chains. He summarized the results as follows:

1—Stresses of 17,000 lb. per sq. in. produced permanent deformations in wrought iron and steel chains amounting to 2 to 4 per cent of length. The cause was the unfavorable bending moment on the members.

2—Deformations of 1 to 4 per cent increased the tendency toward aging in both materials.

3—The best annealing temperatures lie between 1740 and 1830 deg. Fahr. Treatment at 1300 deg. after such deformations produces recrystallization, while heating at 2000 deg. causes injury by overheating.

Hand and electrically welded chains, as well as rolled chains, show diminished resistance to shock after being subjected to stresses in tension of 17,000 lb. per sq. in. As service loads, averaging from 7000 to 10,000 lb. per sq. in., are large enough to cause embrittlement by aging, the author strongly recommends that chains be annealed at least once a year.

Changes in the proportions of the links, designed to give better resistance to bending stresses, are impracticable because they would restrict the freedom of motion of the links, and the expense in grinding new sprockets would be prohibitive.

Steel Heat Treating on a Jobbing Basis

By L. A. LINDBERG

Vice-President
Lindberg Steel Treating Co., Chicago

A COMMERCIAL heat-treating business is similar to a public utility such as the central station company which furnishes electric light and power. The heat-treating company must be able to furnish any sort of steel treatment and furnish it "on the spur of the moment." It must be organized and equipped both as to machinery and men to give this service when wanted and must be available at all times.

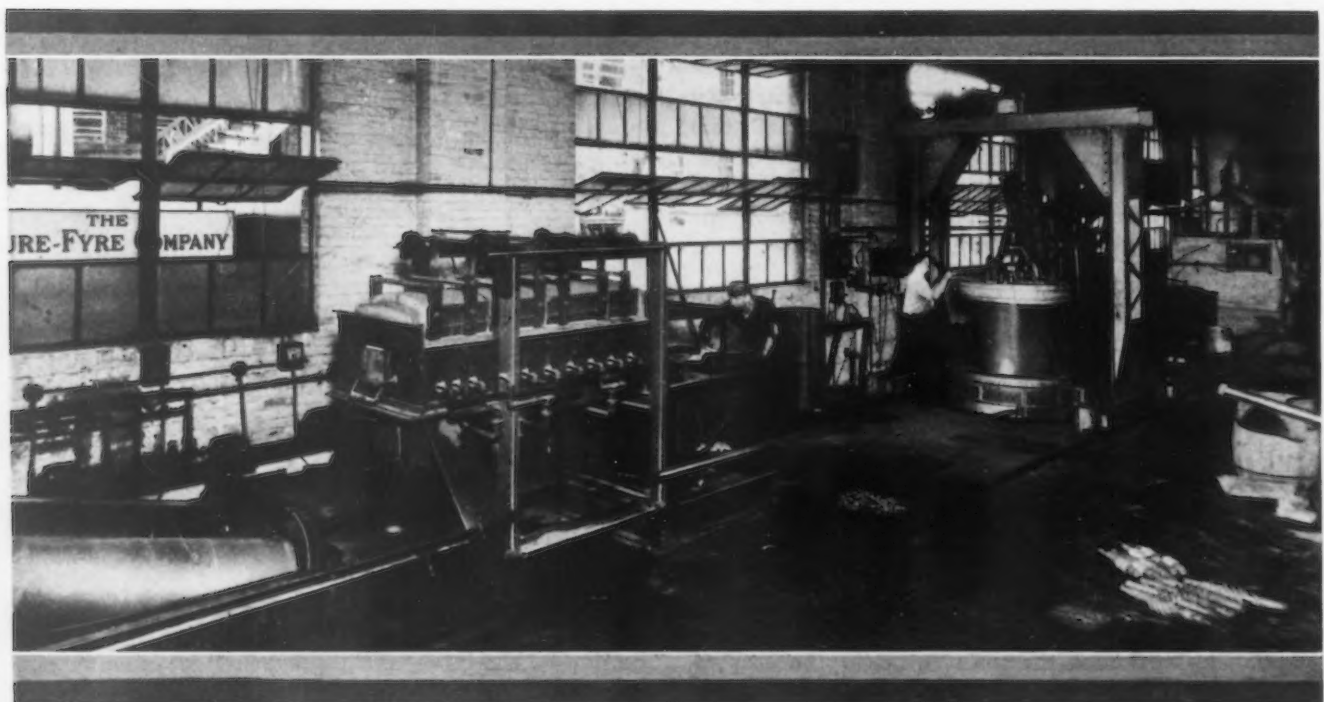
Equipment must be varied and sufficient to handle any size of piece, or quantity of pieces, and to treat them with the least possible lost motion or time. Therefore furnace equipment has to be carefully chosen so that it can handle everything that the customer may have. Highly specialized heat-treating equipment is avoided where there is danger that work for it may be lacking, thereby allowing equipment to stand idle. Only when the quantity of orders is

guaranteed should equipment be purchased that is of a specialized nature.

Heat treatment of steel is a serious business and present-day standards compel specialization. A heat-treating plant should be, in effect, the heat-treating department of each customer. Its officers and employees should consider themselves a part of the personnel of their customer's company. This means that the customer does not have a penny of expense for overhead or heat treatment, except when he uses the service. The job customer's heat-treating cost should be lower because the commercial heat treater operates upon a production basis. Furthermore, the commercial heat treater is often able to advise, suggest and assist in the improvement of the customer's article.

The equipment of a heat-treating plant must be ready to turn to a variety of steels and treatments, whether it is

THE reciprocating hearth furnace, shown in the foreground, is equipped for either oil or water quench. Two nitriding furnaces may be seen in the background.





CHEMICAL testing and photomicrographs serve not only the heat treater but they are also enlisted to help solve problems for the customers.

a production job of heat treating forgings by the ton, carburizing thousands of parts, annealing a carload of steel, or the heat treatment of a small intricate die and tool. The equipment and personnel must be able to handle any and all of these.

Heat treating of heavy contract work, involving tons per day, of necessity requires different equipment and man power from the heat treatment of an occasional piece, weighing a fraction of an ounce or less. To this end the plant of the Lindberg Steel Treating Co., Chicago, has been divided into two parts. The ground floor is taken over by the production heat-treating department, while the second floor is used for hardening all tools and dies. In this way the highly specialized heat treating of delicate tools is isolated from the heavy and rough production heat-treating work.

Upon receipt of a job, the receiving clerk signs for the consignment, checks the count and instructions to make sure they cover the situation. All pieces are then inspected for apparent damage and defects. The job is then routed to the production department where the materials are again examined and instructions checked to verify the make of steel and treatment required.

Many shops have found it absolutely necessary to check the customer's specifications as to brand of steel. Ordinary tool steels can be sparked on an emery wheel to determine fairly well the brand of steel. Daily, customers specify their steels incorrectly either through ignorance or carelessness, and the heat treater must ever be on the alert to catch their mistakes. Detailed instructions are then issued to the department concerned as to procedure. After the parts have been heat treated, they are routed to the inspection department where they are tested for hardness and for any

distortion or defects that may have occurred in heat treatment.

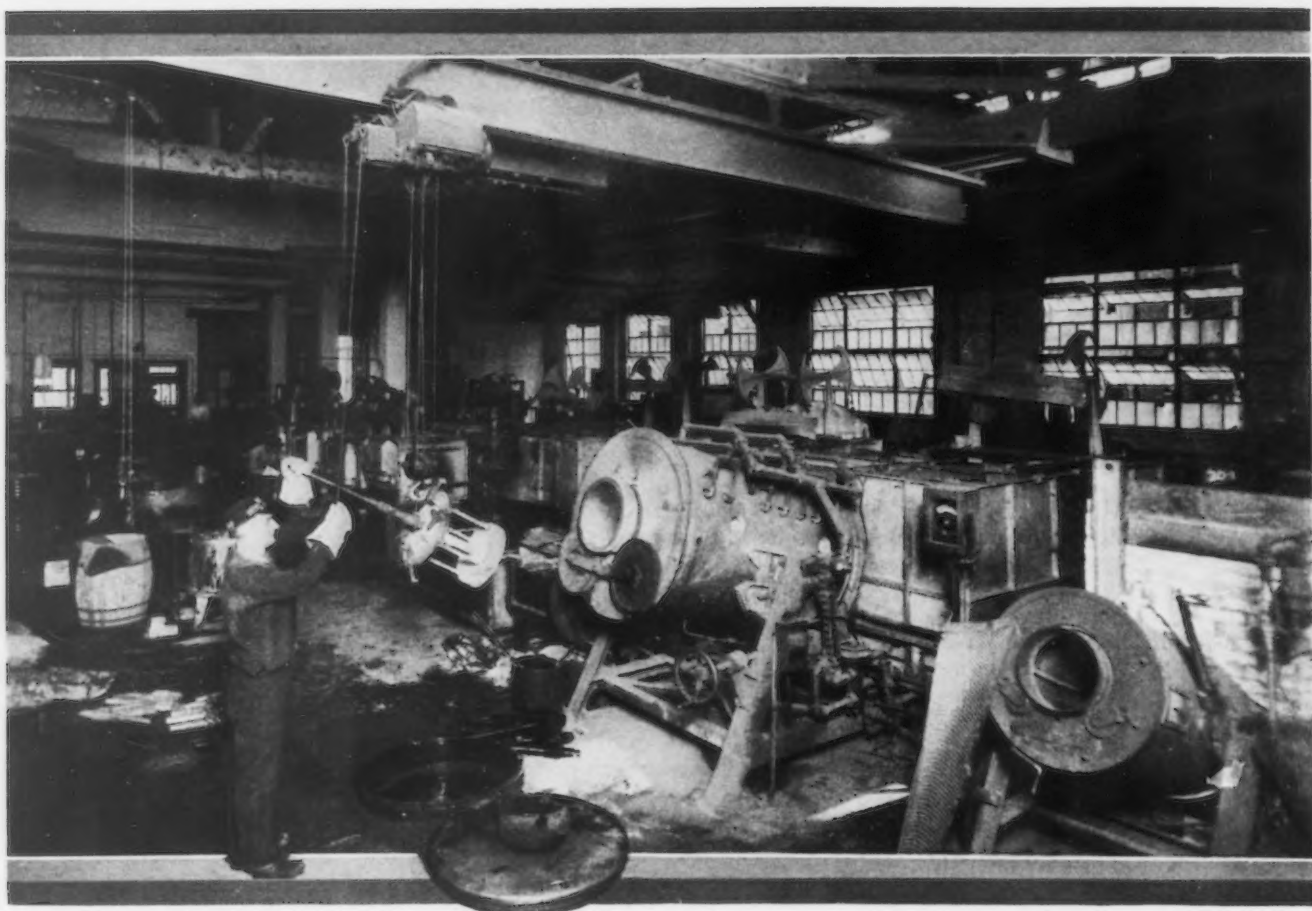
The usual tendency on the part of the customer is to try to rush the job out. Steel treating cannot be hurried. A certain amount of time is required to harden and draw steel and that time cannot be shortened. As a rule, the customer understands this and, with a sufficient amount of equipment, the buyer's time needs can be met. There is always a possibility of doing the rush jobs ahead of the scheduled routine work.

To illustrate these various points as to service, it might not be amiss to draw an outline of the plant of the Lindberg Steel Treating Co. The new plant, constructed in 1930, has approximately five times the capacity and three times the floor space of the former plant which is less than four years old. Readiness to serve is an important phase of the job heat-treating plant, inasmuch as the equipment must be available at all times and, therefore, a number of the furnaces always kept hot so that work may be started on very short notice.

Equipment includes 40 gas-fired furnaces; 5 electrical furnaces; a 10,000-gal. oil quenching tank; a 5000-gal. water quenching tank; 12 miscellaneous quenching tanks; two nitriding furnaces, which are electrically heated; two gas-fired rotary furnaces; a reciprocating furnace which is gas fired; a 100-ton hydraulic straightening machine; an electric straightening machine and eight hand straightening machines.

The tool-hardening department is located on the second floor. Here intricate dies and tools are treated by men highly trained in this special class of work. Each furnace is provided with a pyrometer board on which automatic controls and signal lights guide the operator in the proper control of tem-

BECAUSE a jobbing plant for heat treating steel must be ready to treat many types of steel by several different processes, its equipment must be varied and complete. Such a plant, or laboratory, is described in this article. There are forty-eight furnaces, five of which are electric, and two nitriding furnaces, as well as fourteen quenching tanks, one of them a 10,000-gal. tank for oil.



perature. Windows are equipped with shades which may be raised or lowered so that the furnace tender may judge heat by color, should he so desire. Also located on this floor is a chemical laboratory and microscopic department with complete chemical and analysis apparatus, polishing tables and the photomicrograph room, for making complete tests, analysis and for carrying on research.

In a separate room off the main floor are located tumblers, sand-blasting equipment, the cyaniding department and lead baths. These departments are separated from the main section of the plant by fire-proof sliding doors. These departments are completely self-contained and therefore are able to function without any relationship with the main plant, should it be advisable to operate in this way.

As an additional service to customers this company operates trucks on definite routes so that there is practically no overlapping or duplication of effort insofar as the delivery and pick-up system is concerned. One truck is maintained for special rush jobs and is used when a rush order is at hand and the truck in a given territory is out of direct touch with the office. This company finds that its own delivery service is a real asset. Its drivers thoroughly appreciate and understand the character of the materials they are handling, therefore they are a direct factor in the reduction of breakage and resultant claims.

It also seems that it is legitimately a part of the work of the job heat treater to take upon himself the obligation to follow the steel which he treats to the point where it is used. It necessarily follows, of course,

that this step should be taken in a practical way. He may take many different steps to assure himself that the steel which has passed through his hands is given a square deal. By this same token he may be able to prevent many wastes and losses to his customers, due to the abuse of the steel, misapplications, misunderstandings and mistakes.

As an example many pieces of steel require extensive grinding. The heat treater can very readily attach a tag to all pieces leaving his plant which will draw attention to the fact that surface cracks may develop through the use of a wrong grinding wheel, or because of keeping the wheel in one position too long or through the use of excessive pressure. This practice of issuing a warning very readily builds up a conscientiousness among grinding departments within many miles of the plant.

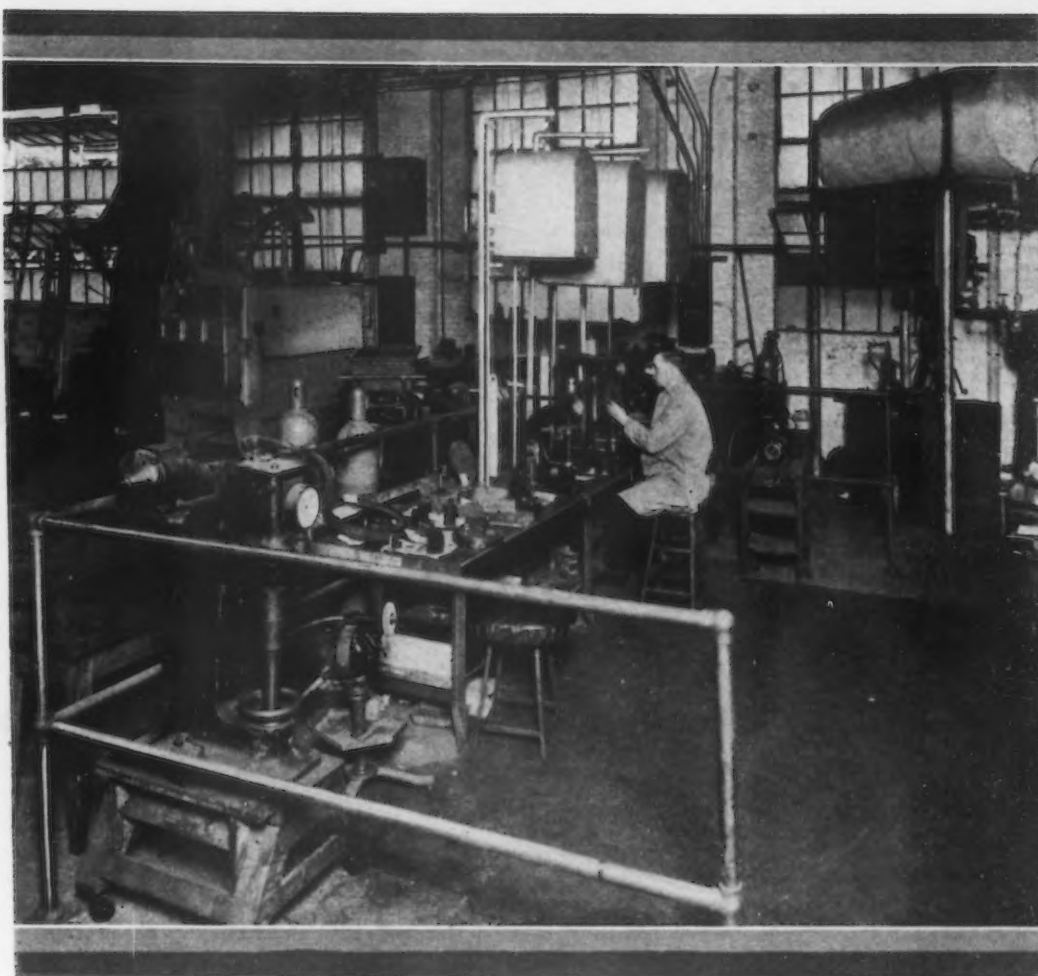
The Lindberg company issues from time to time a publication which deals with the various elements of tool design as it relates to the possibility of cracks and warpage in heat treating. This publication is constantly bringing to the attention of customers the fact that they should tell on their orders the brand of steel to be treated, depth of case required, class of service to be rendered by the steel after heat treatment, and other problems with which the heat treater should be as conversant as is the customer.

It is believed at this plant that, in order to do the best work, it is necessary to have more than adequate equipment and the best of locations and plant layout. It is also necessary to have working conditions such that the man will feel that it is a privi-

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QUENCHING tanks are located convenient to all furnaces, many of which are kept warm 24 hr. a day so they may be brought into use on short notice. (Opposite page.) Hardness tests are made on parts as they pass from the heat treating department to the shipping room. (At right.)

▼ ▼ ▼



lege to work in the shop. Each man has an individual locker. A comfortable room is furnished where the men may eat their lunch and adequate wash room and drinking facilities are provided. Shower baths are laid out so that privacy may be had.

The commercial heat-treating plant has come to be recognized as an important factor in the manufacturing community which it serves. In equipment and personnel it must be prepared to furnish quality service on demand.

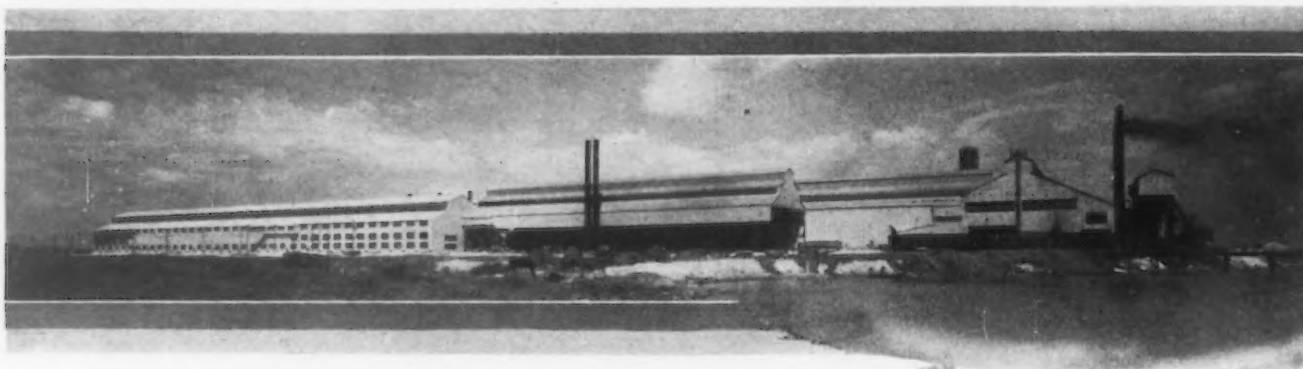
Changes in the Structure of Mild Steel on Annealing

WHEN mild steels are annealed in oxidizing atmospheres the decarburization of the outer sections is frequently accompanied by the formation of columnar crystals pointing from the outer layer toward the center. W. Heike and W. Brenscheidt (*Stahl und Eisen*, Sept. 25, 1930) have studied the development of these columnar crystals in cold-worked material, especially as influenced by degree of previous deformation and by phosphorus content.

The columnar crystals became visible in moderately worked carbon steel after 3 to 5 hr. heating in air or fine limestone below the A_1 transformation (1380 deg. Fahr. was a favorable temperature). The crystals grew larger when the period of annealing was prolonged to 24 hr. Heating produced a noticeable crystal development after 1 per cent cold deformation, a maxi-

mum effect after 3 per cent deformation, and the effect disappeared when the deformation exceeded 6 per cent. After 10 per cent deformation, recrystallization was observed. Grain growth in the interior of the specimens paralleled the crystal development at the borders for moderate deformations. Decarburization was the reason suggested for the grain growth.

In areas rich in phosphorus, heating between the A_1 and the A_2 points caused carbon to be displayed. If the amount of cold work was small, this effect was confined to the high phosphorus areas, but with greater deformations the influence spread. Under non-oxidizing conditions, prolonged heating caused carbon to accumulate in the outer zones. The so-called ferrite halos are low in phosphorus and owe their origin to the fact that, at temperatures below A_1 , the carbon-bearing solid solution absorbs only phosphorus-free ferrite.



Steel Plant Built at the Door of a Great Market

WITH a capacity of over half a million tons annually, the Great Lakes Steel Corp'n. will soon complete the first major construction program for producing steel in the Detroit district. Its original plan called for erection of an open-hearth plant, blooming mill, sheet bar mill and a continuous strip mill, but this was later extended to include two merchant bar mills. Its products will consist of billets, sheet bars, forging bars, strip steel, automobile spring steel, rim sections, bumper steel, window sash sections, concrete bars and small angles and channels.

Expenditure of some \$25,000,000 for these new manufacturing units brings into the foreground the advantages of the Detroit district for making steel. At the door of the steel maker is the largest market for his products, the automobile industry having for the past two years been his best customer. In freight rates alone, the steel plant located in the Detroit switching limits makes a substantial saving in delivery charges as compared with companies in the Pittsburgh and Chicago areas.

Well Located With Relation to Raw Materials

Feasibility of distributing goods nationally from Detroit has been proved by the experience of automobile makers. This carries over into the steel industry as well, for a mill situated in the Detroit district can ship its products by water as well as by rail. Already there is thought of extending sales to the Atlantic seaboard and foreign countries. Development of the St. Lawrence waterway will make possible delivery in New York on a basis which will compare favorably with the Pittsburgh district.

Many advantages accrue also in the assembly of raw materials. As the Great Lakes Steel Corp'n. is a unit of the National Steel Corp'n., which has its own ore properties, ore boats, and blast furnaces in Detroit, the open-hearth furnaces of the new plant can secure hot metal at an exceptionally low cost. Again, the large scrap supply available from the automobile industry makes it possible to purchase heavy melting steel and other items and have them delivered at a minimum freight charge. High-quality limestone also can be secured by water.

While freight rates on coal to Detroit are higher than to mills in close proximity to mines, this handicap is more than offset by freight advantages on other raw materials and on finished products. Furthermore, expansion of oil refinery facilities in the Detroit zone has in great measure done away with the handicap of unfavorable freight differentials on coal.

Six 150-Ton Open-Hearth Furnaces

The open-hearth department of the Great Lakes company consists of six 150-ton furnaces housed in a steel building 208 x 770 ft. The furnaces are connected with waste heat boilers and induced draft fans, discharging into a brick-lined steel stack 180 ft. high. In the design of the furnaces the best practice to secure efficient operation has been followed, particular attention having been paid to flues, checkers and elimination of heat losses wherever possible. Although the furnaces are fired with oil, all equipment has been installed with the exception of gas producers themselves, for using hot producer gas if some day it should prove more economical.

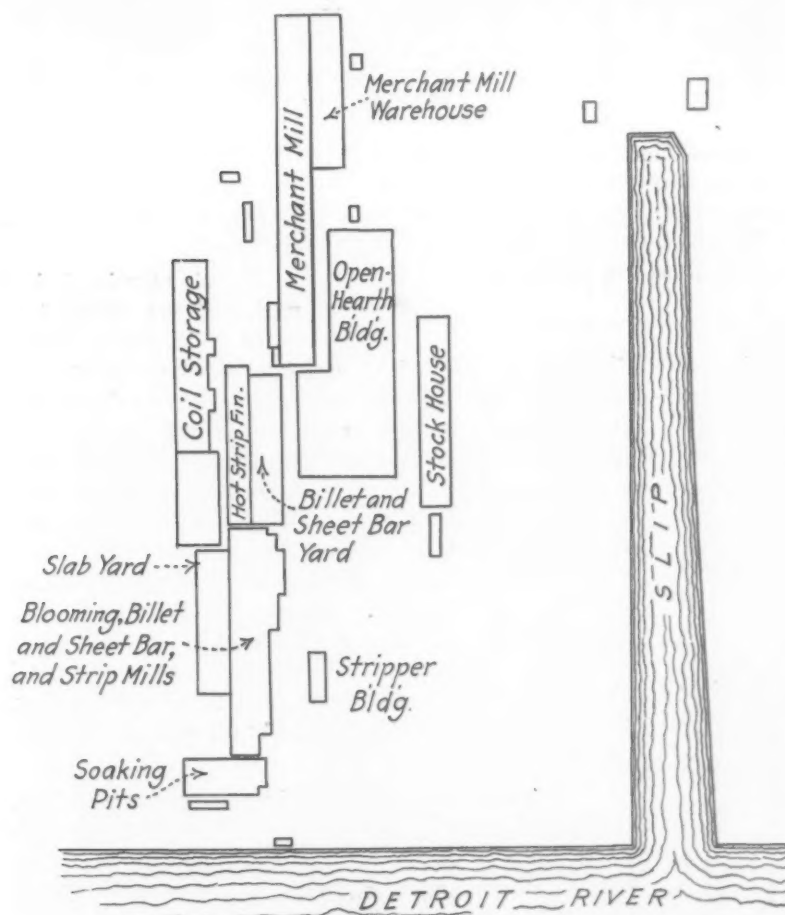
Hot metal is brought in 110-ton mixer-type cars from the blast furnaces of the Hanna Furnace Corp. at Zug Island, less than two miles distant, over the Detroit, Toledo & Ironton Railroad tracks. Diesel electric locomotives of 70-ton capacity transport the hot metal cars, from which the metal is poured into 75-ton ladles, weighed, and charged into the open-hearth furnace.

The charging equipment consists of two 7½-ton low-type floor charging machines and one 125-ton overhead electric traveling crane. The charging floor is designed for rapid charging of furnaces. In the pouring aisle are two 250-ton steel ladle cranes for handling hot metal from furnaces to ingot molds. These cranes are among the largest of their type in the world.

In the north end of the open-hearth building is the auxiliary boiler house, containing oil-fired boilers. Due to extensive electrification of equipment, steam requirements of the entire plant can be easily met under normal conditions by the waste heat boilers, so that the auxiliary boiler house, in effect, is a reserve unit.

Stock Yard Is Covered

Parallel to the open-hearth building and adjoining it is a stock house, 110 x 600 ft., served by two 15-ton overhead electric cranes. The stock house is covered so that the severe Detroit winters will not interfere with regular operation of preparing the open-hearth charge. Next to the pouring aisle of the open-hearth plant is the mold yard, of substan-



The plant is located on the Detroit River and is served by the Michigan Central and Detroit, Toledo & Ironton railroads.

GREAT LAKES STEEL CORPN. plant, on the Detroit River, six and one-half miles from downtown Detroit, has steel-making capacity of 500,000 tons annually.

Open-hearth plant, blooming mill, billet and sheet bar mill and continuous hot strip mill have been completed and a merchant bar mill is under construction.

Hot metal is brought to open-hearths in 110-ton mixer-type cars from blast furnaces of Hanna Furnace Corp., a sister subsidiary of the National Steel Corp.

The plant units are laid out for straight-line production with a minimum of travel. Future extensions can be made with minimum interference with operations.

tial steel frame construction, 33 x 110 ft., served by one 15-ton overhead electric crane. In line with the mold yard at its eastern end is the stripper building, 54 x 150 ft., equipped with a 200-ton electric ingot stripper crane. The relation of the various buildings—stock house, open-hearth, pouring aisle, stripper building and mold yard—facilitates the continuous flow of material with minimum handling. Tracks are arranged for the most economical transportation.

West of the stripper building and parallel to the Detroit River is the soaking pit and gas producer building. Four 4-hole soaking pits of the regenerative type are installed in this building, which is 113 x 275 ft. They are fired with hot producer gas, low fuel cost and maintenance charges being a major factor in their design. They have suspended arch-type covers, with the drive motors mounted on the cover frames. All controls for the pits are concentrated on one control platform which extends the length of the building on the river side. The pits are served by two 7½-ton pit furnace cranes.

Three automatic gas producers, housed in a structure 23 x 54 ft., furnished the hot producer gas for the pit furnaces. At the south end of the soaking pit building is a runway, 22 x 72 ft., over the coal and ash-handling pits. The producers are equipped with a 5-ton overhead electric crane.

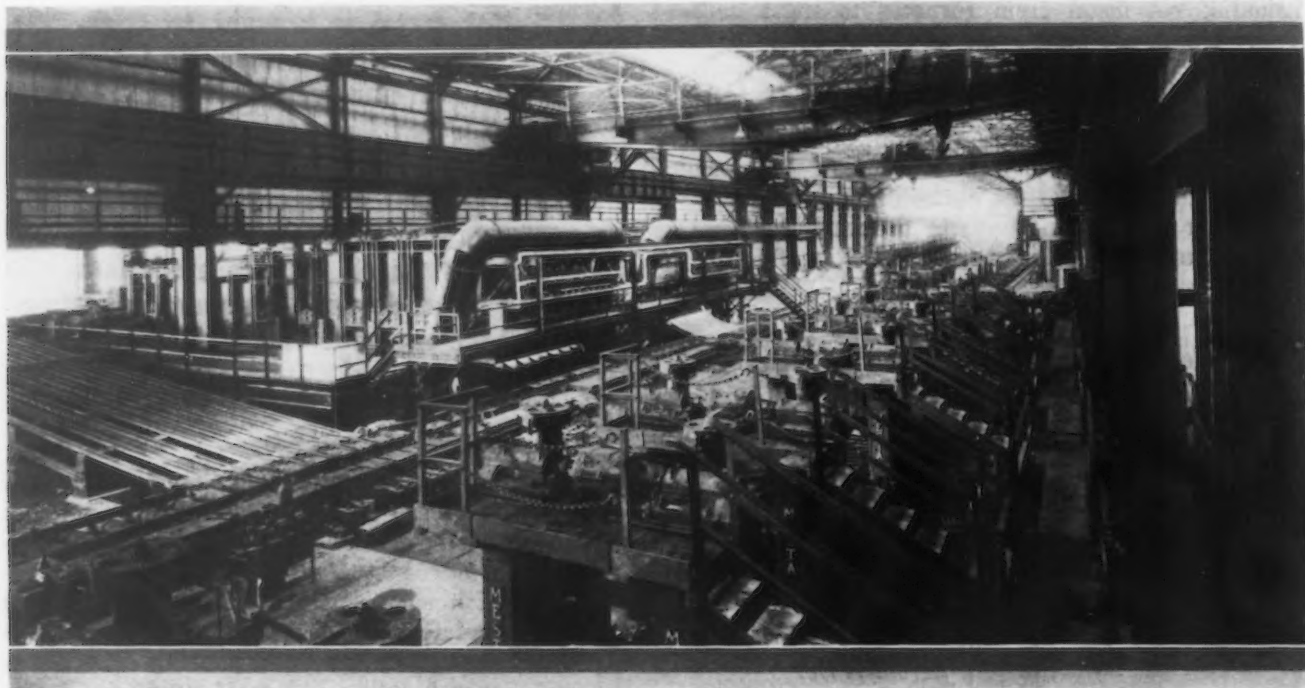
A modern 40-in. blooming mill with auxiliary tables and manipulators is in-

stalled in a building, 95 x 725 ft., at right angles to the pit furnace building and parallel with the open-hearth building. It is driven by a 7000-hp. motor. Equipment includes a 50-ton and a 20-ton overhead traveling crane. Here also is the sheet bar and billet mill consisting of nine two-high roll stands and two edging stands and operated by one 4000-hp., one 5000-hp. and two 2000-hp. motors.

Paralleling the billet mill is the continuous strip mill, composed of four two-high, six four-high and three edging mill stands. It is driven by one 1600-

served by a 15-ton overhead electric traveling crane.

Parallel to the sheet bar and billet yard is the strip mill finishing building, 74 x 500 ft., housing the flying shear, mill runout tables, strip coilers and bar pilers. In it is a normalizing furnace to insure proper heat treatment of material. It has a 15-ton overhead electric crane. Adjoining it is a coil storage building, 104 x 600 ft., for coiled and cut-to-length material from the strip mill. In this structure are located roller levelers, shears and oil machines for finishing strip steel. About midway in



BILLET and sheet bar mill, with slab reheating furnaces serving strip mill in the background. The strip mill is arranged to receive slabs either directly from the blooming mill (not shown) or from the reheating furnaces.

hp., one 2200-hp., one 3000-hp. and six 2000-hp. motors, and arranged so that strip steel can be rolled direct from the blooming mill or from slabs from reheating furnaces. Motor equipment is in a brick building, 44 x 725 ft., parallel to the blooming mill. Served by a 50-ton overhead electric crane, the building houses the necessary generators, switchboard equipment and service water pump, as well as the mill motors. Oil switches and air compressors have been put in a long brick lean-to and adjoining this there is a transformer station.

Billets Delivered Direct to Merchant Mill

Two slab-heating furnaces, each capable of heating 40 tons of slabs an hour, are located between the blooming mill and strip mill. A covered slab yard, 109 x 450 ft., is south of and parallel to the blooming mill. It is served by a 15-ton overhead electric crane. The strip mill finishing building and the sheet bar and billet storage yard are at the end of the blooming mill building. The sheet bar and billet yard has two cooling beds and bar pilers, and is arranged so that billets can be delivered direct to the merchant mills. It is 109 x 475 ft. and is

the building is a lean-to for products from the strip mill.

No. 1 merchant bar mill, not yet completed, is in a building, 114 x

1050 ft., at the end of the sheet bar and billet storage yard and parallel to the open-hearth building. It will consist of 16 stands of rolls and will be complete with necessary heating furnace, roller tables, cooling beds and auxiliary machinery. The mill stands will be driven by one 300-hp., two 400-hp., two 500-hp., two 600-hp., two 700-hp., one 1000-hp. and one 1500-hp. motors, which with generators, transformers and switching equipment, will be housed in a brick building inside the main mill building. The mill is served by one 15-ton and one 10-ton overhead electric crane. To the north is a finishing building, 100 x 450 ft., served by a 10-ton overhead electric crane.

The maintenance shop is in a separate building, 129 x 300 ft., at the end of the slab yard and parallel to the strip mill. It includes the roll, machine, electric, blacksmith and structural shops. In a lean-to is a store room.

Electrical equipment is an integral part of the new plant. All of the equipment in the open-hearth

department is electrical. It is in the rolling mill departments, however, that the use of electric power is the most impressive. In the motor room alone there is over 40,000 hp. in main roll drives. If the capacity of motor generator sets is included, this room has more than 100,000 hp. within its walls.

Steel ingots weighing several tons are delivered from the soaking pits to the blooms or slabs on the 40-in. reversing blooming mill, which is driven by a 7000-hp. reversing motor operating at from 50 to 120 r.p.m. This motor is furnished with power by a 6000-kw. flywheel motor generator set. The blooms or slabs are sheared on an electrical slab shear which has no clutches. It starts and stops for each cut and can make as many as 14 cuts a minute.

Still containing their ingot heat, the blooms pass through the 21-in. continuous sheet bar and billet mill, the first seven stands of which are



HOT strip can be delivered from the last stand at a speed of 1200 ft. a minute. It may be cut on the fly by a flying shear or coiled. The drive of shear, located in the hot strip finishing building here shown, is synchronized with the motors driving the mill stands.



THE 20-in. continuous hot strip mill consists of four two-high and six four-high stands, driven by individual adjustable speed d.c. motors.

driven at a constant speed by one 4000-hp. and one 5000-hp. synchronous motor. The last two stands require adjustable speeds, being operated by a 2000-hp., 600-volt d.c. motor. Sheet bars and billets are delivered from this mill at speeds as high as 900 ft. a minute. An electrically driven flying shear, located in front of the finishing stand, cuts the bars "on the fly" into uniform lengths. This imposes exacting requirements on the electrical equipment, as the cutting accuracy must be within a half of one per cent. The shear also crops the front end of each bar.

Billets or sheet bars, approximately 30 ft. long, are then carried on a run-out table to the bar piler and cooling bed. The table consists of many rollers, each driven by a small squirrel-cage induction motor built into the roller. The speed of the table is adjusted simultaneously by varying the frequency of a.c. power furnished these small motors.



Instead of going through the 21-in. continuous billet and sheet bar mill, slabs sheared on the 800-ton shear may be reheated in one of two special furnaces and delivered to the 20-in. hot strip mill, which consists of 10 tandem stands, each driven by a separate 600-volt d.c. adjustable speed motor. The total capacity of the motors is 20,000 hp. Three 5000-kw. synchronous motor generators furnish power to this mill and also to the finishing stands of the bar mill. Since the same piece of metal may be in several stands at the same time, the driving motors are designed to hold their speed accurately in order to prevent the steel from stretching and to guard against excessive looping.

Shear and Mill Drives Synchronized

Material coming from the hot strip mill may be as thin as 1/16 in. and as wide as 32 in. It can be delivered from the last stand at a speed of 1200 ft. a min. The method by which it is handled after rolling has been worked out electrically. The strip may be cut "on the fly" to commercial lengths with an accuracy of 1/16 in. on an 8 or 10-ft. length. To get such precision the flying shear is driven by a 125-hp. synchronous motor, which obtains its power from a synchronous generator. The generator is connected also with the motors driving the stands. This provides a synchronous tie between the mill and the shear without which such accurate shearing would not be possible.

Instead of being sheared, strip steel may be coiled. In this case the strip passes from the mill over a long runout table, consisting of individually driven motor rollers, to two strip coilers, which are equipped with built-in electric motors.

In addition to the main roll drives there are more

than 300 auxiliary motors used for operating heavy mill tables, screw-downs, shears, transfers, cranes and other equipment. Three 4000-hp. motors drive the pumps furnishing the water to the entire plant; three other 600-hp. motors drive high-pressure hydraulic pumps for scale-breaking sprays.

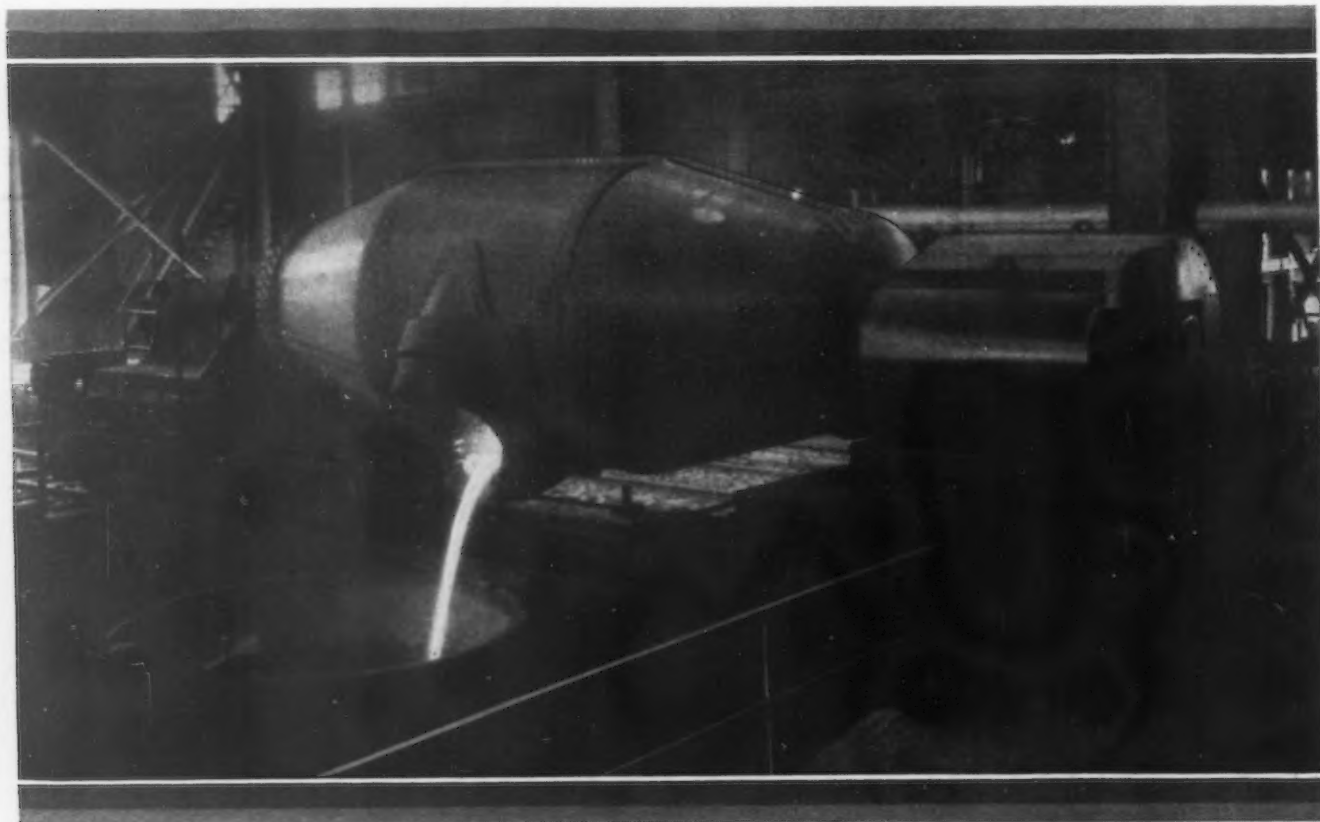
Machinery in the main motor room is arranged conveniently, with ample clearance but no waste of space. The heavy d.c. copper and switch gear is located in the cellar. All machines are ventilated with filtered air, while the heated air which they discharge is forced out of the room by the action of the machines. Thus the electrical equipment and the room are kept clean and the temperature of the room comfortable. A natural desire on the part of operators to keep equipment in good shape further contributes to low maintenance and repair costs. Therefore, a well-designed motor room in a steel mill, as in other manufacturing establishments, is not a luxury, but a prudent and highly profitable investment.

Construction Program Completed Rapidly

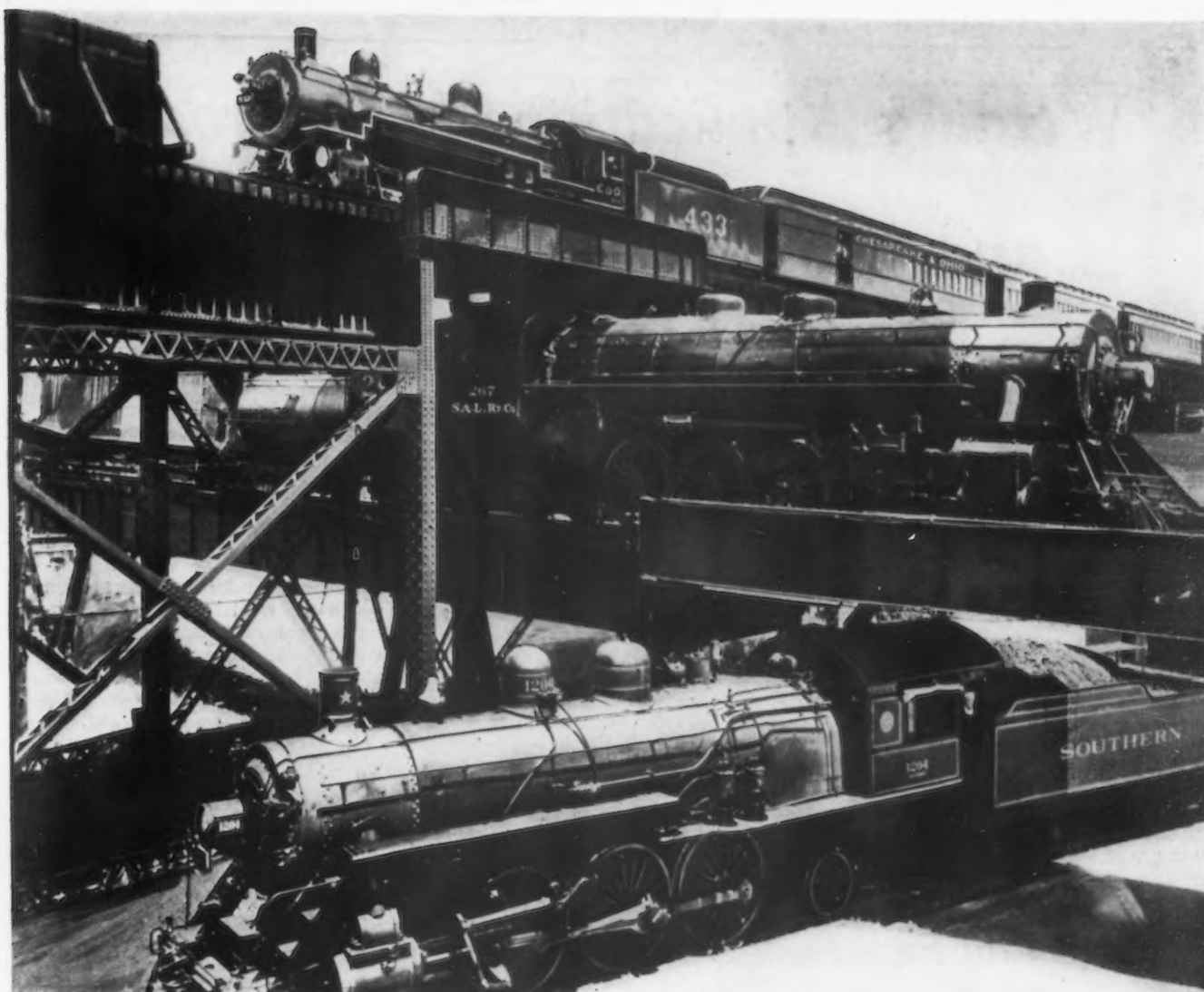
The rapidity with which Great Lakes Steel Corp. is consummating its construction program is in itself an interesting story. Formed in the early part of 1929, the company financed its program through the sale of \$20,000,000 of common stock. Each share carried warrants for purchase of additional stock totaling \$5,000,000 in November, 1929, and a similar amount in November, 1934. However, when National Steel Corp. was organized, the Great Lakes company, in September, 1929, became one of its subsidiaries.

Located in the village of Ecorse, on the Detroit River 6½ miles from downtown Detroit, the com-

(Concluded on page 1665)



Hot-metal car emptying into a 75-ton ladle.



RAILROAD use of steel in recent years has run less to construction of locomotives and cars and more to the separation of grades, the building of bridges and other maintenance-of-way development. When three railroads cross each other on one grade, safety demands that something be done about it. This picture shows what was done in Richmond, Va., at Seventeenth and Dock Streets, where the lines of the Chesapeake & Ohio, Seaboard Air Line and the Southern Railway cross each other. Almost everything within the range of the camera is made of steel—an apt illustration of the various ways steel is used by the railroads.

Welding Applications In Railroad and Other Fields Expanding

WELDING problems in railroad, airplane, pipe line, aluminum tank and in home construction fields were among the topics featured at the five technical sessions of the thirty-first annual meeting of the International Acetylene Association, held Nov. 12 to 14 at the Congress Hotel, Chicago.

The expanding application of welding was forcibly brought to the attention of the meeting by L. R. Gurley, editor, *Welding*, Pittsburgh, when he reminded his listeners that a considerable saving was made in welding the 10,000-ton cruiser recently put in service by the German Government; that all-welded engine-driven cargo ships have been built in this country during the past year, and that all-welded street cars and railway tank cars are in service in France and Ger-

many. He told of having examined recently a full set of drawings prepared by the mechanical department of an American railroad for an 80,000-lb. capacity steel box car and a passenger coach, the superstructures of which will be of all-welded construction. There has been in operation for over a year a switching locomotive, the frame of which, with all of its auxiliary fittings such as the spring and brake hanger brackets, has been welded into one piece by the oxy-acetylene process. The boiler tubes, the back flue sheets and the water syphons are also welded in place. The tender back of the locomotive is entirely welded. Mr. Gurley foresees, within ten years, a locomotive designed to carry a boiler pressure of 800 to 1000 lb. per sq. in. which will be built almost entirely by welding.

hanging metal on the rail is brought to forging heat and hammered back into place, thereby lessening the amount of weld metal required and improving the quality of the weld by working out seams or impurities that might exist in the rail ends.

Quality of the weld metal applied to building up rail ends is of paramount importance, because the section to which the weld is applied is subjected to greater stress than any other part of the rail. The welded rail end should be harder than the original rail metal, but it must not be so brittle that it will check or break out. A few alloys containing chromium have proved most suitable for the building up of rail ends.

Savings secured by reconditioning rail ends depend mainly upon the quality of the work. The built-up joints must permit the rail to remain in position a sufficient length of time beyond its ordinary life to more than cover the charges entailed by changing out the rail. The added life necessary to secure economy will depend on traffic conditions and standards of maintenance.

Since 1922 the Burlington railroad has welded approximately 1,092,000 rail joints with a steadily decreasing cost from an average of \$1.32 a joint in the first year to 76.7c. for this year up to Sept. 1. Reduction in cost was due to several factors, such as reduced price of gases, increased efficiency of welders, improvement in welding procedure and some variations in the general condition of the rail ends welded.

Battered Rail Ends Built-Up By Welding

IN the minds of railroad engineers there is no question as to the effectiveness and economy of building up battered rail ends to improve the riding qualities of the track, to increase the life of rail in first position, to decrease the wear upon track fastenings and to minimize the wear and tear on equipment. Difference of opinion exists, however, as to which method of building up rails is most effective and economical. These observations were disclosed by S. E. Tracy, track welding supervisor, Chicago, Burlington & Quincy Railroad, Chicago, who delivered a paper on "Cold Facts Concerning the Welding of Battered Rail Ends."

In general the purpose of the welding is to remove the batter and to match up the rail ends as neatly as possible so as to permit the smooth transfer of wheel loads from one rail to the other without objectionable impact. Experience on the Burlington has been that at least 90 per cent of the rail which is ready for welding has developed either a slight bend or has been hammered low in surface at the joints. In applying a straight edge to such joints, it has been found that the space between the straight edge and the rail varies in length from a few inches to the full length of a 24-in. straight edge. To restore the track to good running surface it is

not necessary to fill in the entire space between the straight edge and the rail, nor is any good accomplished by so doing. It is not necessary to level up the surface of the joints by carrying the weld back beyond the batter.

Procedure with the oxy-acetylene torch involves forging the deposited metal with a hand hammer as the weld progresses. In addition, the weld is completely reheated and then smoothed by means of a flatter and a sledge. Any mushroomed or over-

Aircraft Tubing and Pipe Line Welding

IN a paper on "Commercial Aircraft and Welding," Charles Froesch, general service manager, Fokker Aircraft Corp. of America, Hasbrouck Heights, N. J., outlined the procedure followed in welding steel tubing used in aircraft construction. This tubing is either of low carbon S.A.E. 1030 steel or of chrome-molybdenum steel.

From the production viewpoint, the rapidity with which a welder works is an indication of his skill, as a real quick weld is a good weld and a slow weld is often poor because it either results in the material being burned or in irregularities of the surface.

Welding of carbon steel is a simple matter but trouble was experienced in the early days when aircraft manufacturers first began to use chrome-molybdenum steel tubing. This was due to lack of knowledge as to how tubes should be fitted before welding. It was found absolutely necessary to provide enough clearance between the tubes to be welded and the structure so that expansion of the weld and the tubing itself would be insufficient to create an internal strain within the tube material. If this is not done a permanent strain remains within the tube and failure due to cracking or

splitting is liable to occur under the vibration to which every airplane structure is subjected.

When fitting tubes it is customary to leave about 1/32 in. clear at each end to allow proper fusion and filling up of the weld. It is sometimes possible to straighten a slightly bent tube by means of wooden blocks or a rubber mallet. Tubes which cannot be straightened can be replaced either by butt-welding new tubes to the old structure or by fishmouth welding. With the fishmouth type of welding, the length of the diagonal cut at the ends of the new tubes should be in the ratio of 3 to 1 of that of the diameter of the tube. This will result in an area of the welding in shear larger than that of the cross sectional area of the tube itself so that if properly made the weld would be the stronger of the two. It is also customary to use a larger tube than the one sawed off and slip it over the stub ends of the tubing remaining on the structure.

Welding of Large Gas Pipe Lines Discussed

The question of composite construction on large gas lines was discussed by G. O. Carter, consulting engineer, and T. W. Greene, engineer development section, Linde Air Products Co., New York, in a paper on "Success of Oxy-Acetylene Welded Pipe Lines." More or less standard practice has been to use solid welded construction for lines smaller than 18-in. The same construction has also been used on 18 in. and 20 in. sizes. Above 20 in., however, the practice has been to use composite construction because the solid welding of large diameters necessitates special engineering consideration in construction.

Theoretically, the unit stresses set up in a large pipe as a result of temperature drop are the same as for small lines, but due to their very nature, there probably is an unequal distribution of the contraction forces in large diameters which impose higher stresses on certain elements than on others. The problem is further complicated by the introduction of differential stresses in the large lines during construction. Moreover, it is much more difficult to provide adequately the slack in the line required to compensate for contraction.

Bending of Large-Diameter Pipe a Problem

In addition to the temperature stresses there are superimposed bending stresses which from the very nature of the line cannot be minimized in the large diameters. Smaller pipe can be easily bent cold to fit the contour of the ground, but in the large diameters this cannot be carried to such accuracy, with the result these strains may become excessive. There is need for development of more satisfactory procedures and methods in the way of bending the pipe to meet the contour, of providing for expan-

sion-contraction and of adopting practices that will assure extremely high weld quality to withstand the strain set up on the circumferential joint in the construction and operation of large diameter lines.

With the long distance transportation of gas, economical factors have necessitated the use of very high pressures, which, in turn, have required special high-strength pipe. Large diameter pipe having a carbon content of 0.30 to 0.40 per cent and

an ultimate strength of 80,000 to 100,000 lb. per sq. in., is being used today. The welding of such pipe has necessitated raising the quality of the welding. One outstanding development being followed to assure high weld quality is the use of a thin backing-up liner to aid in welding the pipe joint. These liners are about 1/16 in. to 3/32 in. thick, depending upon the pipe diameter, and about 1 1/4 to 1 1/2 in. wide; they fit the inside of the pipe joint under the butt weld.

STEEL box car and passenger coach having all-welded super-structure planned by American railroad.

Reconditioning of battered rail ends by welding improves riding qualities of the track and decreases wear and tear on equipment.

More than 1,092,000 rail joints welded by Burlington railroad since 1922, with steadily decreasing cost.

Large-diameter high-strength pipe for transporting gas long distances calls for high quality of welding. Backing-up liners found to aid in welding such pipe joints.

Welded steel houses cost about the same as those of wood construction. In addition they are fireproof, able to withstand severest storms, are sanitary and inexpensive to maintain. Both labor cost and erecting time are materially reduced.

In welding aluminum tanks, butt welding is preferred because of speed and reduced danger of entrapping flux in the weld. The method of applying flux and its removal after welding are important.

Outlines Advantages of Welded Steel Houses

ALTHOUGH steel is more expensive than wood, the final cost of an all-welded steel house will be about the same as that of wood construction, according to Eric H. Ewertz, consulting welding engineer, New York, who addressed the convention on "Welding in the Construction of a Home."

The all-welded steel house is fireproof, able to withstand severe storms, probably even cyclones and earthquakes. It is sanitary, inexpensive to maintain and, if properly insulated, is easy to keep warm. The steel members may be assembled on the ground adjacent to the site, permitting large sections to be raised up and even set in recesses in the foundation walls and anchored by grouting them in; where the sections are of transportable size and sufficiently light for two men to handle, they may be fabricated in the shop ready for erection.

Steel framing is made up of studs, beams, caps, sills, rafters and ridge pole, all of a heavy sheet steel channel rolled to a special form similar to what in the building trade is known as metal lumber but modified to in-

crease the strength. The studding for a house of average size comprises 4-in. channels spaced 16 to 18 in. apart, and horizontally braced with 1/2-in. thick flat bars spaced about 24 in. apart. Beams are 8-in. to 10-in. channels, depending on length and load; they are also braced top and bottom by 1/2-in. flat bars on 24-in. spacing. Rafters are of 6 to 7-in. channels, also braced; for the stairs, channels form the stringers and flat bars and angles form the steps and risers. Metal lath is wired to the flat bars on both sides of the studding as well as both sides of beams and rafters.

As soon as studding is in place the beams can be placed in position, braced and welded. Welding is simple because of the general availability of welders and equipment. Further, because of the relative lightness of the steel, most of it about No. 14 gage, the welding can be performed by use of either bronze or steel welding wire, giving a strong bond without excessive length of weld.

It was said that the most costly

item in home construction, that of labor, has been materially reduced by this method of construction, and that

the time required to erect the building has been cut down 50 per cent or more.

Welding Aluminum Tanks

THE straight butt-type weld was recommended for aluminum tank work by W. M. Dunlap, aluminum research laboratories, Aluminum Co. of America, New Kensington, Pa., in his paper on "Welded Aluminum Tank Trucks." The butt weld increases welding speed considerably, and there is not so much danger of entrapping flux in the weld. Aluminum tanks should be designed so that welds are not made on corners or immediately adjacent to bends. The flanges on the heads should be at least 3 in. deep and the heads and shells should be accurately formed so that the parts fit closely together.

Most of the aluminum plate used in tank construction is from $\frac{1}{8}$ in. to $\frac{5}{16}$ in. thick. The $\frac{1}{8}$ -in. material is usually prepared for welding by notching the edges with a cold chisel, the notches usually being about $\frac{1}{16}$ to $\frac{1}{8}$ in. deep and about $\frac{3}{16}$ in. apart. Materials thicker than $\frac{1}{8}$ in. should have the edges beveled to form a 90-deg. vee. Bevels should not be carried entirely through the sheet but about $\frac{1}{8}$ in. lip should be left. On very heavy material it may be advisable to use a double vee and weld from both sides. In setting up the work for welding, spacing of any kind is avoided. Long seams should be tack welded at intervals of from 5 to 8 in. All tack welds should be burned in well and when widely separated should be 2 or 3 in. long.

How to Remove Oxide Film Before Welding

The oxide film on aluminum must be removed before welding. This may be accomplished either by puddling the molten metal in the weld or by use of a proper flux. The puddling method has never proved satisfactory for sheet metal. The best way to use flux is to mix it with water to the consistency of thick paint or cream, and either pour it on the seam or apply it to the filler wire. The latter is preferred, because in permitting application of the flux in sufficient quantity in the place and at the time necessary, it is more economical of flux.

In making the weld, the torch is held at an angle of about 30 deg. with the sheets, and the tip held about 1 in. from the puddle. The flame should be directed so that it heats both sheets uniformly and melts the edges of the sheets and the filler rod at the same time. The end of the filler rod must be kept in the flame as the heat in the puddle is not sufficient to melt the wire. As the welding progresses it is necessary to increase welding speed since the temperature of the sheet gradually rises.

Because of the high thermo con-

ductivity of aluminum it is found, particularly when welding heavy material, that a much larger torch must be used than would be expected.

Selection of Welding Rod or Filler Rod Important

Proper selection of welding wire or filler rod is of importance. When welding light-gage commercial aluminum or 3S material, pure aluminum wire designated as 2S may be used. In welding heavy 3S material, particularly if it is in the hard rolled condition and the work is not preheated, the filler rod should be of such composition that it will have a very low solidification and thermo contraction, as well as high strength and ductility at elevated temperatures. Usually $\frac{1}{8}$ -in. wire should be used for $\frac{1}{8}$ -in. material, and $\frac{3}{16}$ -in. or $\frac{1}{4}$ -in. wire for the heavier work.

When welding rather heavy material, it is common practice to deposit two layers of weld metal, usually from one side of the sheet only. In tank construction, however, the recom-

mended practice is to weld the longitudinal seam and one head from both sides; that is, deposit the first layer of metal from the inside of the tank and the second layer from the outside of the tank, or vice versa as may be desired. When the final head is welded in the tank both layers of metal must be deposited from the outside. The first layer of weld metal should be burned in thoroughly so as to insure good penetration, and the vee is only half filled.

Flux Carefully Removed After Welding

When working from an end or starting a weld, care is necessary when depositing the second layer of metal. It is advisable to start at a point about 5 or 6 in. from the end and weld back toward the normal starting point before starting down the seam.

When welding has been completed the flux should be carefully washed from the tank. Warm water and a vigorous application of a stiff scrubbing brush is a very good means of removing flux, while for corners and crevices where flux may be entrapped, a steam jet, closely followed by a stream of water, is very good. Soaking in a warm aqueous solution of 3 to 5 per cent nitric or sulphuric acid is probably the safest means of flux removal. The acid bath should be followed by a rinse in water.

WELDING IN THE FAR NORTH

IN a crowded city or busy industrial center an electric welding outfit, if not in use, gets slight attention. But coming upon such equipment 625 miles north of Edmonton, Alberta, Canada, would give rise to active reflection as to the far reaching spread of the methods of present-day civilization.

This outfit, a General Electric 200-amp. welding generator driven by a Continental four-cylinder gas engine, was shipped by scows and motor boats from Edmonton and put to work on Hudson Bay steamer boilers and other ship welding. It is believed to be located farthest north of any welding outfit on the continent.



Production Milling Machine with Spindle Speeds Up to 1000 R. P. M.

DESIGNED for the application of tungsten-carbide cutters, the Milwaukee Simplex production-type milling machine being announced by the Kearney & Trecker Corp., Milwaukee, embodies several interesting features, including a spindle speed as high as 1000 r.p.m. Either of three standard speed ranges, with 12 speed changes, can be furnished; these are 15 to 150, 30 to 300 and 100 to 1000 r.p.m.

Noteworthy also is the spindle quill construction. A heavy brace ties this quill to the double overarm and, in being mounted at the extreme end of the quill, it provides a strong stiffening support throughout the entire cross adjustment. When the spindle

drive throughout the entire cross adjustment of the spindle quill.

Spindle Mounted on Three Roller Bearings

The spindle is mounted on three large roller bearings; two of these are



quill is moved outward, the quill brace goes with it, thus furnishing "adjustable rigidity" to the spindle and cutters.

The spindle quill, made from a steel forging, and heat-treated, hardened and ground, is 7 in. in diameter and has longitudinal or cross adjustment of 7 in. It is locked in the spindle block by two clamps located at the right-hand side of the spindle block uprights. Cross adjustment is by a handcrank attached to the squared end of the shaft, located midway between these screws, and provided with a dial graduated in 0.001 in. One turn of the adjusting shaft moves the quill 0.250 in.

Heavily constructed herringbone gears are used for the spindle drive. Instead of splining the large spindle gear and having it slide on the spindle, this gear is solidly mounted on the spindle and its driving pinion is splined. This construction is emphasized as assuring positive spindle

THE table dogs are located in a built-in compartment and are fully protected from dirt and chips.

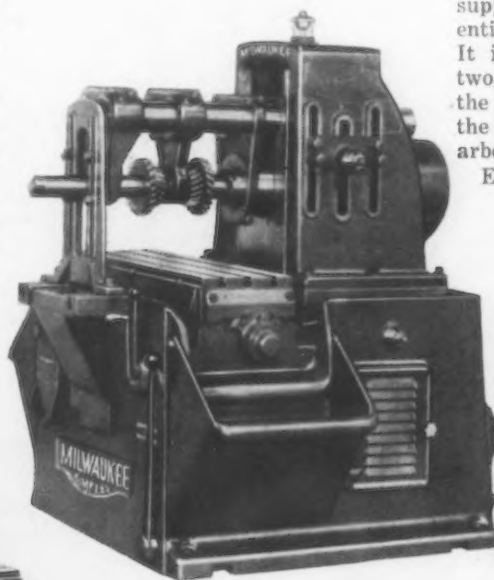
of tapered type and are located at the extreme ends of the spindle, while the third, of straight design, is on the inside hub of the spindle quill. The rear tapered bearing is mounted in the housing that surrounds the driven gear and which is permanently attached to the quill as an integral unit. This construction is intended to assure a smooth, free-running drive.

Increased strength for high cutting speeds is obtained by mounting the spindle block between heavy double uprights. The block has bearing surfaces for its full length, being guided and aligned by a deep tongued slide and held to adjustment with a full

length gib. When the spindle block is clamped in place, the entire head becomes practically one solid unit. Vertical adjustment of the spindle block is by handcrank located at the right-hand side of the bed and convenient to the operator when setting his spindle either in or out, or up and down. A dial, graduated in 0.001 in., permits precision settings.

Coordinated adjustment for the arbor and overarm braces is a feature making for convenience. When adjusting the cutters in or out, it is not necessary to disturb the independent relations of the arbor to the arbor supports and double overarms. The entire unit moves with the handcrank. It is merely necessary to loosen the two bolts that clamp the overarms in the spindle block and the two bolts in the T-slots at the base of the outer arbor support, at the front of the bed.

Either of two ranges of 18 feeds,



IN addition to speeds that permit correct application of tungsten-carbide cutters, this production miller embodies several unique features of construction, such as the spindle quill and brace arrangement that provides "adjustable rigidity" of the spindle and cutters.



$\frac{1}{2}$ to 20 in. or 1 to 40 in. per min., is furnished. Feed changes are made at the front of the machine by pick-off gears located behind a hinged door. Power rapid traverse is at the rate of 240 in. per min.

Table Dogs Entirely Inclosed

Another feature of this machine is the method of mounting the table dogs that control the feed and rapid traverse movements. These are located in a built-in compartment at the front side of the table and are fully protected from dirt and chips by means of a cover plate.

Milwaukee Simplex machines are

offered in two series—1200 and 1800—the first two numerals designating table widths. In the 1200 series there is a choice of either 18, 24 or 30 in. of table feed; in the 1800 series the choice is between 24 in. or 30 in. These tables are held in adjustment by a heavy gib running the full width of the bed. In addition to T-slots, the tables are provided with a series of self-cleaning $\frac{3}{4}$ -in. workstop holes.

The machine is of unit construction, the five major units being the bed, double uprights, spindle block, saddle, and table. The bed, cast in one piece, contains all operating units, which include the motor, main driving clutch and brake, speed and feed gear units, coolant and lubricant pumps and reservoirs. Through the use of a heavy bolted saddle, all operating units of the table can be self-contained and made readily accessible for adjustment and maintenance. The saddle construction is further emphasized as eliminating the necessity of a large opening at the front of the bed, thus stiffening the entire bed casting.

With the exception of the outer bearings of the table screw, the entire machine is lubricated automatically by a gear-type pump driven from the main drive shaft. The sight feed gage at the top of the double uprights indicates operation of the lubricating system. Coolant is distributed by a large gear-type pump that operates automatically when the spindle is engaged. The pump has a low-pressure release valve so that coolant is supplied to the cutters in large quantity at low pressure. This pump is self-contained and can be withdrawn from the machine by removing six screws. It is driven by a sliding gear that can be disengaged by a small lever.

The machine has multiple V-belt drive consisting of four belts. The driving motor is mounted on a pivoted bracket that can be adjusted to properly tension the belts. Air is forced through the motor compartment when the machine is in operation. All machines are arranged to accommodate either 5 or $7\frac{1}{2}$ -hp. motors.

Net weights of the machine vary from 7300 to 8300 lb., depending upon bed and table sizes.

National Metal Congress for 1932 in Detroit

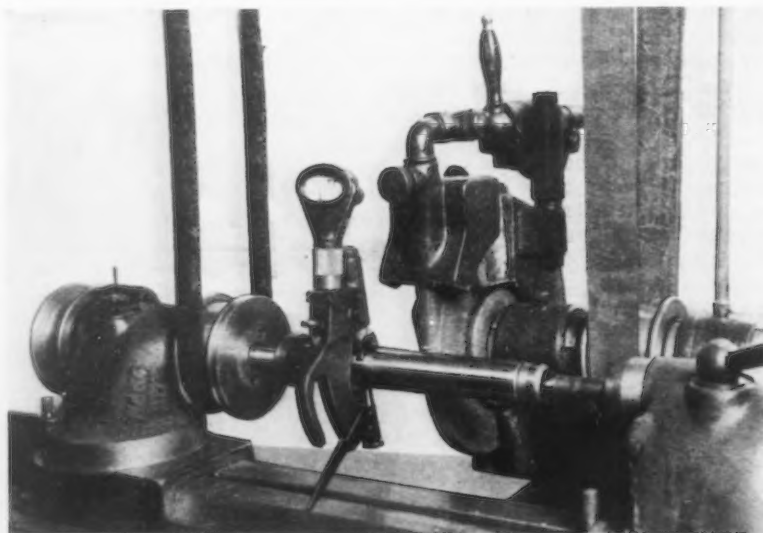
Announcement is made in *The Review* for November, published by the American Society for Steel Treating, that the National Metal Congress and Exposition in 1932 will be held in Detroit the week of Sept. 19. It is expected that the society will entertain a party of British metal men, members of the Iron and Steel Institute and the Institute of Metals, who are to visit this country in 1932. According to present plans, the party will reach New York on Sept. 10 and will visit the eastern and middle-western parts of the country until Sept. 30, when they will sail from Montreal.

Portable Gage for Use on Cylindrical Grinders

FOR gaging work on cylindrical grinders without stopping the machine, the Coats Machine Tool Co., 110 West Fortieth Street, New York, is offering the portable Krupp Mikrotast gage here illustrated. To offset the

mounted in position on another.

The gage is set to a master and so adjusted that the indicating hand stands close to the right-hand scale extremity. If the gage is then placed on larger spindles which are yet to be



The gage may be removed easily from one grinder and applied instantly to another. The gage shown covers a range of $1\frac{1}{4}$ -2 in., using two interchangeable lower anvils.

abrasive action of the rotating work, all contact points exposed to wear are faced with Widia cemented tungsten carbide.

Thumb-pressure on the lever will raise the V-shaped upper jaw, which is then snapped on the work and held there by means of this jaw and the adjustable support that rests against the bed of the machine. The adjustable support must be set so that the gage clears the grinding wheel cover, as shown. The gage may be removed easily from one machine and instantly

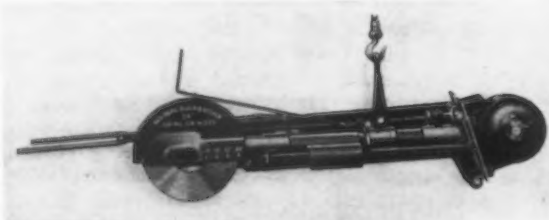
ground, the indicating pointer will stand at the left-hand scale extremity. Pointer movement to the right signifies smaller diameters, whereas pointer movement to the left indicates larger diameters. Thus, during the grinding operation, the pointer will travel from left to right. The fan-shape knife-edge Mikrotast indicator is graduated in 50 graduations of either 0.0001, 0.0002, 0.0005 or 0.001 in.

Five sizes of the gage, covering a range from $1\frac{1}{4}$ -8 in., are made.

Multiple-Speed Swing Grinder

A SWING frame grinder having three speed changes has been brought out by the Black & Decker Mfg. Co., Towson, Md. This machine is available with 12, 16, 18, 20 and 24-in. wheels, and a primary cutting speed of 6000 or 9000 ft. per min. As the grinding wheel wears, change of speed is obtainable by

moving the adjustable steel wheel guard back the proper distance. With the guard there is an arrangement which prevents the operator from failing to make the speed changes as the wheel wears. A visual device on the guard enables the shop foreman to tell at a glance whether or not the operator has made proper



AS the grinding wheel wears, change of speed is obtainable by moving back the adjustable wheel guard accordingly.

guard and speed changes to compensate for wear on the wheel. The guard itself is designed to provide maximum safety for the operator.

The machine is of rugged construction and is equipped with a heavy-duty ball bearing motor capable of 100 per cent momentary overload.

Die Stock Threads Four Sizes of Pipe

A NEW die stock that with one set of dies will thread four sizes of pipe, 1 in., 1¼ in., 1½ in. and 2 in., has been brought out by the Ridge Tool Co., Elyria, Ohio. It will also thread over and under size threads, drip threads and short nipples. Dies of a new design cut straight on the face with only the cutting edge in contact with the pipe. Design of the dies, it is pointed out, makes it easy to put the die stock on the pipe and makes cutting smooth and fast. Setting dies for different diameters of pipe is mechanical and it is claimed always accurate. No tools are needed. Dies can be set with the work holder



The one set of dies will thread 1, 1¼, 1½ and 2-in. pipe.

on the lead screw in any position. A thumb lever opens the dies for backing off, saving wear and chipping.

The centering device is of inclosed type. A knurled dial on the work holder is twisted until an arrow points to the size of pipe to be threaded and clicks into place. Then the die is put on the pipe and tightened with one thread screw. An arrow on the ratchet pawl indicates the direction of cutting.

Pull of the handle is directly over the dies, eliminating cocking and wobbling. The tool is designed with ample chip room and for easy application of cutting oil.

Existing simplified schedules for sheet steel and eaves trough, conductor pipe, conductor elbows and fittings have been reaffirmed for another year by standing committees of the affected industries. Announcements to this effect have been sent out by the Division of Simplified Practice to manufacturers, distributors and users.

Stationary Die With Circular Chaser

A NEW self-opening die head with circular chasers, designed for use on screw machines, turret lathes and other machines with non-rotating die



Unusually long runs between grinds is claimed for the chasers.

holders, has been added to the line of the National Acme Co., Cleveland.

The new die, designated as the Namco DS, supplements the DR die head for use on machines with revolving spindles, as described in THE IRON AGE of June 5. Quick removable circular chasers permit unusually long runs between grinds. They are accurate thread forming tools mounted upon "quick removable" chaser blocks, the faces of which are ground to the exact helix angle of the thread. The DS and DR chaser blocks and chasers are interchangeable for the corresponding die sizes; any one chaser may be replaced without the necessity of replacing the entire set.

Chips shoot out ahead of the chaser, and close-to-shoulder threading is said to be made safe by the positive action of the die in opening. A feature of the new die is the ease with which the chasers and blocks may be removed; this is accomplished by hand simply by removing the knurled nut and handle, sliding back the die cup and taking out the chasers and blocks.

The DS die is built in seven sizes, from ¾ to 3¼ in.

Portable Power Unit

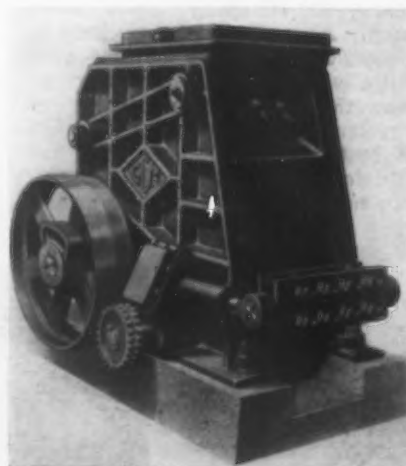
A PORTABLE power plant, weighing 120 lb., capable of delivering 1000 watts, and designed to meet the needs of construction and repair crews for a convenient and portable source of power, has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh. The plant is provided with duralumin skids to make it easy to transport, and is powered by a gasoline engine developing 2 hp. at 4000 r.p.m.

Only one moving part is exposed, all other parts being inclosed in a sealed bath of oil, protected from dust and dirt. The gasoline tank has a capacity of 2½ qt.—sufficient to operate the engine for 3 hr. under full-load conditions. The engine speed is controlled by an automatic mechanical governor. Accurate speed adjustment is provided between 1800 and 4000 r.p.m.

Ore Crusher Incorporating Yielding Jaw Principle

POWER and other savings are claimed for the new rock and ore crusher manufactured by Guest Crushing Machines, Inc., 107 Annandale Boulevard, Los Angeles.

The machine incorporates the yielding jaw principle and utilizes roller bearings throughout. The crushing action, after material is crushed to size, is downward for one-eighth of each revolution, and is said to be such as to accelerate the passage of sticky material. The machine, built in a number of sizes, may be used either as a primary or secondary crusher. The 6 x 6-in. size illustrated will handle rock at the rate of 9 tons per hr. when set at ¼ in. This takes into consideration a maximum feed of 6-in.



materials, delivering a uniform product of 5/16-in. size.

A breakable shear pin prevents throwing the motor shaft out of alignment in case foreign material becomes lodged in the crusher jaws. Provision is also made for instant release of this foreign matter without the necessity of dismantling or use of explosives. All working parts are accessible, and size adjustment of the finished product may be made while the machine is operating. The Norma Hoffmann roller bearings employed are equipped with oil and dust seals. The unit comprising the flywheel pulleys, shaft and bearings are precision balanced before assembling. The manganese steel jaw plates may be easily removed without dismantling the crusher and the eccentric jaw plate is reversible.

Large Planers Designed for High-Speed Operation and Ease of Control

UNUSUAL power and rigidity under the heaviest cuts and at high speeds, together with flexibility of control which simplifies operation, are outstanding characteristics of a new line of large planers developed by the G. A. Gray Co., Cincinnati.

The first of these machines, which have been named the "Ultra-Size," has been shipped to the Niagara Machine & Tool Works, Buffalo. It weighs approximately half a million pounds and has capacity to plane work 12 ft. wide, 10 ft. high and 30 ft. long. Equipped with a 75-hp. 200 to 1200-r.p.m. General Electric reversing motor drive, this planer has table cutting speeds ranging from 20 to 120 ft. a min. and independent variable return speeds in the same range. A new type of control developed by General Electric engineers for use on these machines provides maximum safety and adds considerably to the flexibility of operation.

In these "Ultra-Size" planers ease of control is a major feature. To raise the rail the operator merely presses a button on the pendant switch marked "raise," this action causing the clamping motors to unclamp. As soon as the unclamping is completed, the rail elevates automatically. When the operator releases the button, the rail stops and is reclamped automatically. A similar button marked "lower" is provided for lowering the rail.

To rapid traverse a head in any di-

rection, the operator makes a single shift of a lever. There are three stations at which this operation may be performed. Each rail head may be controlled at either end of the rail or at the head. The operator may also hand-traverse the cutting tool in any direction at any of the three stations. Graduated micrometer collars on the heads permit movements of the tool point to be determined to 0.001 in. by direct reading. The side heads each have three control stations, one at the outer end, one on top near the inner end and one on the bottom near the inner end.

A slight angular shift of a lever engages or disengages the feed of any head at any of the three rapid traverse stations. Corresponding levers at the other two stations move synchronously so that the operator can see the setting of the feed from any position on or near the planer. The feed may be made to occur at either end of the stroke. Positive feed mechanism is used for all four heads, and the amount of feed of each head may be varied independently of the others.

Rail Heads Weighing 2 Tons May Be Moved by Hand

Each rail head has two feed dials, one at each end of the rail, which are controlled by handwheels. The handwheels rotate in unison and the dials are synchronized; thus the feed for either rail head may be set in either

end of the rail. All four heads have automatic tool lifters which may be engaged or disengaged at will. Although weighing 2 tons each, the rail heads may be moved horizontally by hand or the slides may be moved vertically by a light touch on the control handles. This ease of movement is accomplished by means of a system of counterbalances. The weight of the head is carried by compression springs and two ball-bearing rollers which roll in a groove on top of the rail. The weight of the slide, tool box, apron and cutting tool is separately counterbalanced by means of a weight acting through a steel cable on ball-bearing sheaves. With this system the tool is always rigidly held in position ready to cut and does not drop down when it leaves the work.

A taper gib between the saddle and the top of the rail gives the saddle a snug sliding fit and prevents "cocking" of the head when taking heavy slide cuts with long tools. The harp is swiveled on the saddle by rotating a crank on a gear box mounted directly on the harp. The tool box is swiveled by a ratchet crank on a worm meshing with a sector machined in top of the box. The rail heads are of such design that the tools in the two heads may be brought to within a few inches of each other.

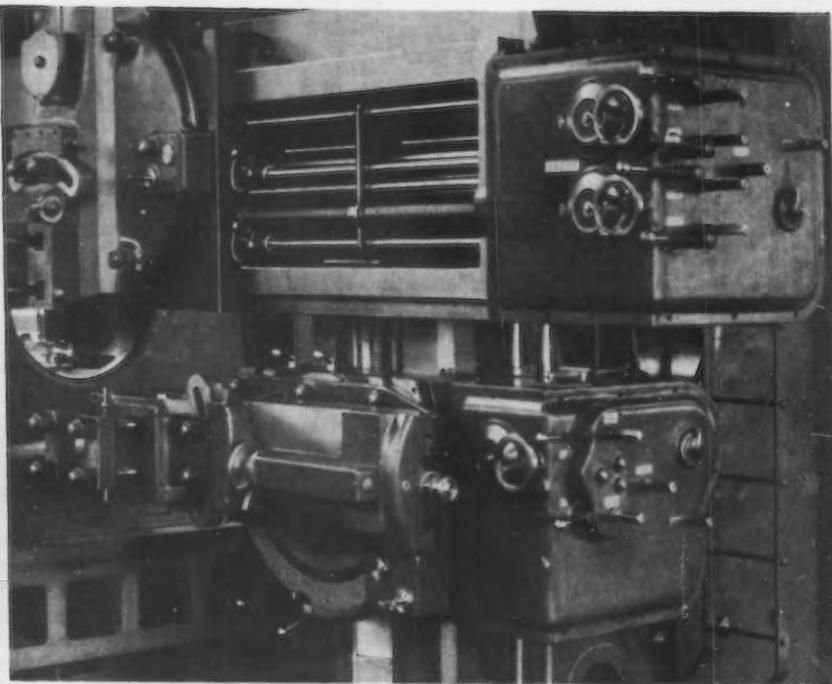
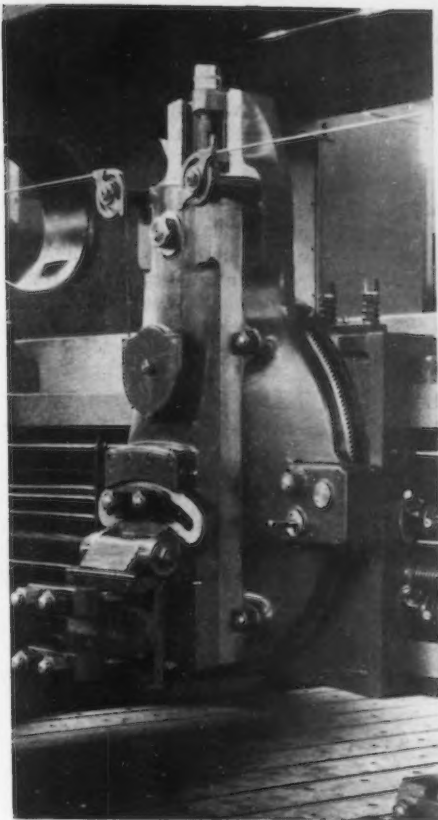
Driving gears are of forged steel and are of helical type throughout. The center section of the bed which contains the gear train and to which the housings are bolted is a large casting 4 ft. deep weighing 36 tons. The bed is supported throughout its length on three rows of leveling screws resting on steel plates grouted into the foundation of the machine. The table, which weighs 60 tons, slides on two Vs and two flats. The

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THIS machine, the first of a line of "Ultra-Size" planers, has capacity to plane work 12-ft. wide, 10-ft. high and 30-ft. long, and is designed for speeds to meet future developments in tungsten-carbide and other hard alloy tools. The system of controls is noteworthy, being developed to eliminate two-man operation of these large machines.

▼ ▼ ▼





CLAMPING and unclamping of the rail of these "Ultra-Size" planers is automatic. Other conveniences include control of rapid traversing of heads in any direction by a single shift of one lever from any one of three stations, and varying the amount of feed of each head independently of the other heads.

ways are lubricated by a constant pressure system which insures proper distribution of oil to all bearing surfaces. Wherever practicable, all gears, shafts and clutches are supported by anti-friction bearings, a

total of 407 ball and roller bearings being used in the machine. The planer is protected by safety devices which not only relieve the mechanism of strain, but also give warning of faulty operation.

pinion shafts in the drilling heads. The pinions on this shaft mesh with racks in the feed sleeve. The drilling feed is operated by a hand lever located on the end of the pinion shaft of the right-hand head.

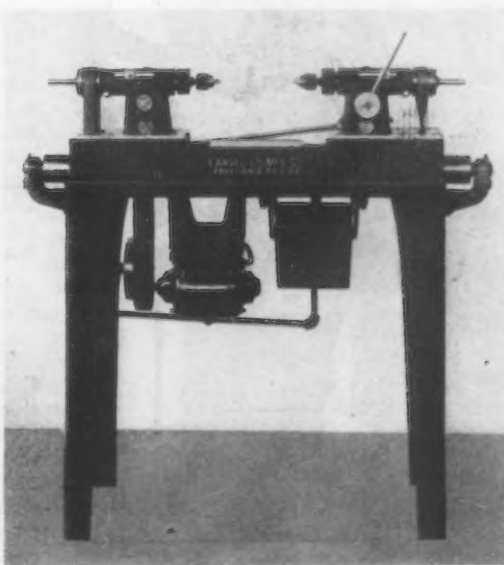
Both spindles are driven by belt from a jackshaft located inside of the bed. This shaft is mounted on four ball-bearing pillow-blocks and is driven by belt from a motor mounted underneath the bed. The motor is on a swinging baseplate that provides for taking up belt stretch. An oil tank is also attached to the under side of the bed; from it coolant is pumped to each of the drills. The machine occupies floor space of 22 x 50 in.; it weighs approximately 525 lb.

Horizontal Duplex Drilling Machine

THE Langelier Mfg. Co., Providence, R. I., has added to its line the horizontal duplex drilling machine illustrated, which has capacity for driving drills up to $\frac{3}{8}$ in. in steel. The drilling heads can be adjusted to a working position varying from 3 to 16 in. between chuck ends. The distance from the center of the spindles to the table is 6 $\frac{1}{2}$ in.

Gibbed T-slides are provided at each end of the bed, in which the drilling heads can be positioned and clamped. The hardened and ground drilling spindles run in phosphor bronze bushings, and deep-groove radial ball bearings are used to counteract the drilling thrust. The spindles can be arranged to run at speeds ranging from 1200 to 6000 r.p.m. They are mounted in feed sleeves, which are equipped with adjustable stops for drilling to predetermined depths. The spindles are driven from ball-bearing pulleys mounted on sleeve trunnions

clamped into the outer end of the feed sleeve bores. The pulleys carry driving collars having two keys that engage splines in the spindles. The drilling heads are fed simultaneously by means of a connecting-rod and levers mounted on the ends of the



Alan Wood Steel Co., Conshohocken, Pa., has published an 80-page book covering in considerable detail its various products. The book opens with a brief history of the company, which had its inception shortly after the Revolutionary War, when James Wood established a smithy at Hickorytown, Pa. Since then the Alan Wood Steel Co. has been continuously identified with the development of the iron and steel industry. Another chapter is devoted to plants and products. Considerable space, with illustrations and diagrams, is devoted to floor plates. Other chapters cover sheared steel plates, billets and pig iron. The book contains a great deal of miscellaneous data that will be of service to engineers, purchasing agents and contractors.

The National Exposition of Power and Mechanical Engineering will be held at Grand Central Palace, New York, Dec. 1 to 6.

Press with Capacity for Drawing 1/8x24x24 In. Stainless Sheet Shells

IN addition to mammoth proportions, the single crank double-action toggle drawing and deep stamping press illustrated, recently completed by the Toledo Machine & Tool Co., Toledo, Ohio, embodies a

number of special features. The toggle mechanism which operates and controls the dwell of the blank-holder slide is located in the crown, thus permitting use of twin gearing and giving a compact arrangement and increased strength.

All of the toggle operating parts are steel castings bronze bushed. The press is operated by the Toledo patented multiple-disk friction clutch with independent brake, which gives positive control at all times. The clutch mechanism is arranged so that the press may be operated continuously or stopped at any part of the stroke; by changing the position of the small stud, the press can be started in the usual manner and will automatically stop at the top center.

The total weight of this press is approximately 450,000 lb. The height, overall, is 35 ft. 2 in. The stroke of the plunger slide is 45 in., with an adjustment of 10 in. by a power elevator, using a 10-hp. 1200-r.p.m. reversible motor.

The distance between the uprights is 69 in. The plunger is 50 in., front to back, and 42 in., right to left, while the blank-holder is 68 in., front to back, and 57 in., right to left. The top of the bed is 68 in. square. The die space, or the distance from top of the bed to bottom of the plunger slide, with stroke down and adjust-

ment up, is 80 in. The bolster plate is 8 in. thick.

The flywheel is 72 in. in diameter, has a 24-in. face, and weighs 11,000 lb. The twin gears on the main shaft are 125 in. in diameter, 16-in. face. The press is triple geared in the ratio of 80.1 and makes 3 3/4 strokes per min. A 200-hp. driving motor is employed.

The crankshaft is sufficiently large to provide ample capacity for drawing a stainless steel shell 24 in. in diameter by 24 in. deep, by 1/8 in. thick.

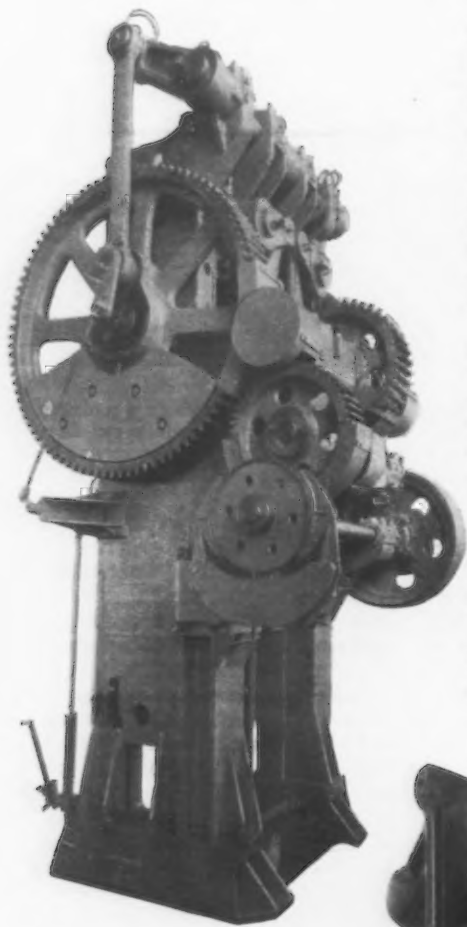
Grinder for Tungsten-Carbide Tools

FOR grinding and re-sharpening tungsten-carbide-tipped cutting tools, a new 10-in. precision grinder has been developed by the Black &

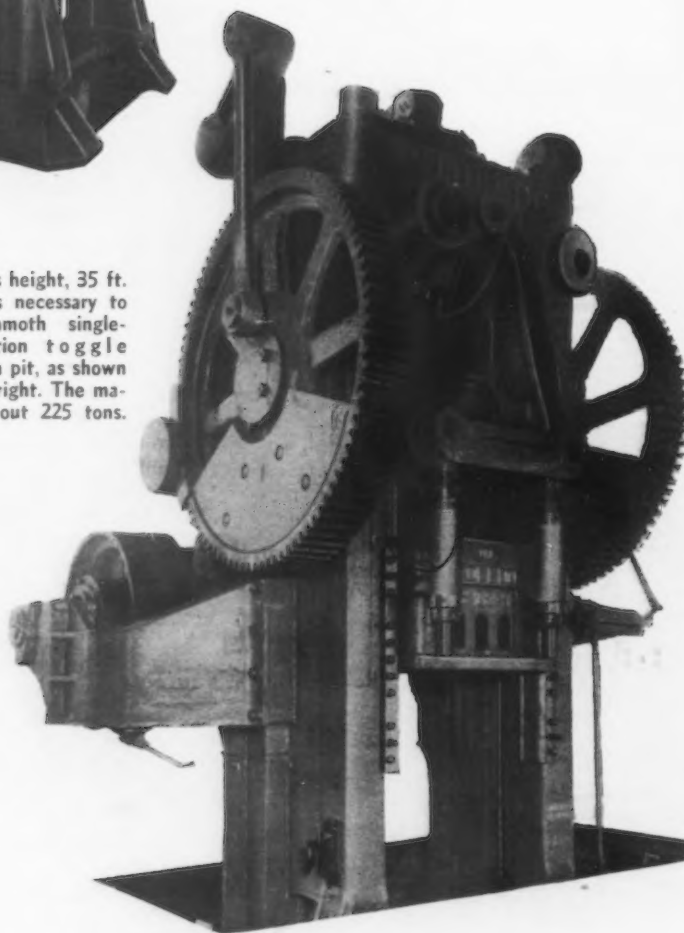


Decker Mfg. Co., Towson, Md. Sharpening of these tools accurately to the proper angles is made possible by a special tool rest which has a self-contained graduated scale that is fully and precisely adjustable to any position or angle. Two types of the machine are built; one accommodates a 10-in. cup-type wheel on the right-hand spindle and a 10-in. straight side wheel on the left-hand spindle, while the other is arranged with two 10-in. cup-type wheels, one on each spindle. Rugged construction is a feature emphasized.

The Harbison-Walker Refractories Co., Pittsburgh, has completed a motion picture illustrating methods employed in the manufacture of refractories. The film is available, without cost, to technical societies, engineering organizations, industrial organizations, colleges and research laboratories.



BECAUSE of its height, 35 ft. 2 in., it was necessary to build this mammoth single-crank double-action toggle drawing press in a pit, as shown by front view at right. The machine weighs about 225 tons.



National Founders' Association Takes Step to Relieve Unemployment

RECOGNIZING the situation that has been brought about by unemployment, the National Founders' Association, at its thirty-fourth annual convention in New York last week, recommended to its members that they so manage their affairs as to give the greatest number of days' work per week to the greatest number of employees.

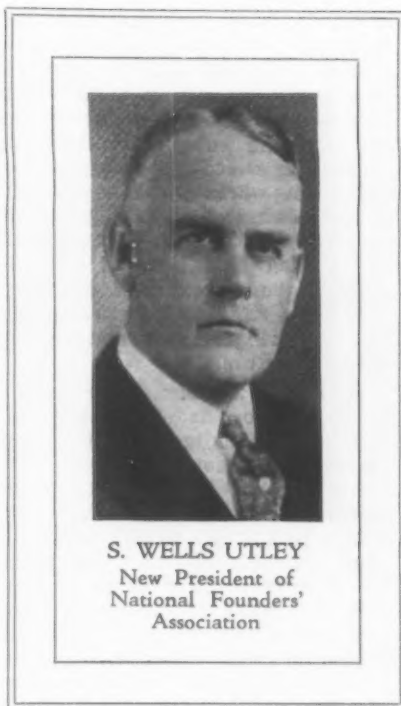
The business depression was the theme of several of the addresses delivered at the convention, but the belief was expressed that the worst of the slump is over and that better conditions may be expected in the early part of next year.

Aside from effects of the depression, the thing most stressed in the meetings was the educational work of the association, a development of recent years which will be carried on more energetically than ever during the coming year in the holding of a series of regional meetings of instruction for plant managers, superintendents and foremen.

S. Wells Utley New President

Col. Thomas S. Hammond of the Whiting Corp., Harvey, Ill., who has served the association for two years as president and who is succeeded by S. Wells Utley of the Detroit Steel Casting Co., a former president of the American Foundrymen's Association, paid particular attention to the educational work in his report of the progress of the association during the past year.

"Industrial conditions are constantly changing, and we are constantly acquiring new values and meeting new forces," said Colonel Hammond. "Industry's methods in taking care of the problems that are arising from our present depression show the progress we are making. Unemployment, for example, has never before had such efficient handling. Instead of the wholesale laying off of employees, as in the old days, there has been an intelligent division of work so that as many as possible may have a reasonable measure of support. Thrift plans, insurance plans, education of the employee so that he may better plan for his future, have given him still further protection. To the extent that we anticipate and solve these problems for ourselves, to that extent will we be free from the danger of perhaps unwise governmental regulation. No better time than now could be found for studying them so that later the present unfavorable business situa-



tion may be turned into the greatest possible profit."

Regional Meetings for Foremen

Following Colonel Hammond's remarks, L. W. Olson of the Ohio Brass Co., Mansfield, Ohio, chairman of the committee on industrial education, announced that the committee had decided upon a plan for regional meetings to carry the educational work of the association to the managers and foremen of the greatest possible number of manufacturing plants throughout the country.

Dr. Harry Myers, Dayton, Ohio, consulting industrial engineer, until recently with the Frigidaire Corp., Dayton, who is to take a prominent part in these regional meetings, presented an entertaining, human-interest demonstration of the kind of talk he will deliver to foremen's clubs in an effort to inspire foremen with their responsibility in bringing about more efficient plant management. A great deal of what he had to say applies equally to the managing executives of manufacturing companies.

He defined progress in industry as "the making of a better product at a lower cost. If you do not believe this," he added, "look out!"

"Do you resist change? Do you oppose a new idea? Do you resent criticism?" he asked. "If you do," he said, "there is no progress."

Progress, he explained, resolves itself into work, and work means the right use of time, energy and materials.

Asserting that age is not a matter of years but of point of view, he added: "If you think that what you are doing is done as well as it can be done, then you are already old."

Dr. Myers' plea was for a recognition of the growing importance of the new science of industry—human engineering, so called. He warned his listeners that this science is growing very fast and that those who fail to observe this change and keep step with it will be hopelessly left behind in the competitive race to come.

Laws of Good Work

He defined six laws of good work as follows: 1. Be clean and orderly; 2. Take good care of property, equipment and materials; 3. Follow instructions carefully and continually; 4. Work well from whistle to whistle; 5. Work every day and tell your foremen when you cannot; 6. Work well with others.

These are the points he will drive home in his talks at foremen's meetings. He placed greatest emphasis on cleanliness and orderliness, saying that good work cannot be done and safety and efficiency cannot be obtained if cleanliness and orderliness are not maintained.

He also gave six principles of successful foremanship: 1. A clean, orderly department; 2. Proper equipment; 3. Proper materials; 4. Proper instruction; 5. Proper supervision; 6. Proper pay.

Others who will participate in the regional foremen's meetings are L. W. Olson, factory manager, Ohio Brass Co., whose subject will be, "Making the Shop Safe," and C. S. Koch, president, Fort Pitt Steel Casting Co., McKeesport, Pa., who will discuss "Reducing Costs."

Oral requests for the meetings were voiced by representatives of most of the important industrial cities of the country, and a schedule will shortly be worked out for these meetings, from which much is expected in improving the general average of workmanship in plants of the members throughout the country.

How University Aids Industry

What the university is doing and can do in cooperation with the foundry industry in its educational program was explained by Richard S. McCaf-

fery, professor of metallurgy, University of Wisconsin, who told of classes that have been conducted in Milwaukee for the past few years by him and his associates in the University of Wisconsin. One class of graduate metallurgists is doing a considerable amount of research work in connection with its studies.

Another class is being conducted in Milwaukee for foundrymen who have had no technical education. This class is usually attended by about 80 men, who discuss their own problems with guidance by the metallurgists of the university.

Professor McCaffery said that the foundries of the country should co-operate with their State universities in research work. "The technology of metals has developed so rapidly," he said, "that a lot of men in the foundry industry don't know much about it, or are afraid of it. If the foundry industry is going to develop, it must do its own research."

He pointed out that it is obviously impossible for individual foundries to attempt such researches, and cooperative effort with the universities is the most practical plan. He commented on the fact that there are many laboratories in the United States, but not more than eight that are doing fundamental work.

Discusses Agricultural Problem

Economic problems came in for discussion at one session of the convention. Thomas D. Campbell, a farmer of Hardin, Mont., asked for a more tolerant attitude toward the work that the Federal Farm Board is attempting to do. He said that there is a widespread effort to discredit the work of this board, the establishment of which he mentioned as the only piece of legislation ever

passed directly for the benefit of the farmer. He praised the ability of Alexander Legge and the sincere efforts he and his associates on the board are making to solve the crop situation. He said that one of the greatest obstacles to a solution of the agricultural problem is that "no one believes the farmer can succeed."

World Economic Problems Serious

Walter Case, president of the investing banking firm of Case, Pomeroy & Co., New York, took issue with Mr. Campbell on the American wheat situation and said that the only solution is for a cutting down in the amount of wheat grown in this country and the substitution of other crops. He stated his belief that low prices for wheat would tend to cut down the wheat acreage without other pressure. Within five years, he said, the United States would virtually cease to be an exporter of wheat. This he ascribed to the growing supply in world markets, and particularly from Russia.

Mr. Case mentioned the agricultural situation as only one of the world-wide maladjustments that must be corrected before permanent prosperity returns. He commented on the overproduction of oil and the uneven distribution of the world's capital as other serious problems to be solved. Tariff barriers, war debts and the serious deflation of purchasing power in countries that are large producers of raw materials were also commented upon as calling for remedy to admit of successful solution of the world's economic disturbances.

He called attention to the American railroad situation, which he viewed as grave if continued efforts are made in the building of waterways that

will further deplete the revenues of the railroads, which have been declining more or less steadily since 1920.

The most favorable sign in the domestic situation, he said, is the fact that commodity prices have declined so far and so fast that an upward trend must soon be in order. He stated, however, that retail prices have not declined to the same extent as wholesale prices, but he predicted that retail prices would go lower after Christmas and will come within closer reach of the consumer's purchasing power.

New Use for Gray Iron Castings

A new use for gray iron castings—as curbing for pavements, loading platforms, etc.—was described by Robert E. Moore, vice-president, Flockhart Foundry Co., Newark, N. J. Mr. Moore showed lantern slides of a number of installations of gray iron curbs in cities of northern New Jersey, where its use on new pavements has become quite general, particularly where heavy trucking impacts have proved granite and concrete curbing to be of short life.

T. Yeoman Williams, managing director, League for Industrial Rights, New York, discussed unsound economic practices in electrical construction and stated that the restrictions of the electrical workers' unions have increased building costs and have prevented the use of many labor-saving and cost-saving improvements.

William C. Wright, who is in charge of the service department of the National Founders' Association, gave a lantern slide talk on improvements in foundry equipment and practices. Mr. Wright's paper will be published in a later issue.

National Founders' Association's New Officers and District Committees

President: S. WELLS UTLEY, Detroit Steel Casting Co., Detroit.
Vice-President: C. H. HOFFSTETTER, Odin Stove Mfg. Co., Erie, Pa.
Secretary: J. M. TAYLOR, 29 South LaSalle Street, Chicago.

DISTRICT COMMITTEES New England States

HENRY S. CHAFFEE, Builders' Iron Foundry, Providence, R. I.
EDWIN W. SMITH, H. B. Smith Co., Westfield, Mass.
GEORGE A. RAY, Taylor & Fenn Co., Hartford, Conn.
A. J. O'CONNOR, Hunt-Spiller Mfg. Corp., Boston.
WALTER ABBE, JR., Smith & Winchester Mfg. Co., South Windham, Conn.
New York and that part of New Jersey north of a line drawn from Lambertville to Point Pleasant, and the provinces of Ontario and Quebec, Canada.
WILLIAM E. VAN HORN, Otis Elevator Co., Buffalo.
M. F. SIMMONS, General Electric Co., Schenectady, N. Y.
W. W. CHENEY, JR., S. Cheney & Son, Manlius, N. Y.
WILLIAM LONSDALE, Foster Wheeler Corp., Carteret, N. J.
J. L. LONERGAN, Morris Machine Works, Baldwinsville, N. Y.

Pennsylvania, Delaware, Maryland, District of Columbia and that part of New Jersey south of a line drawn from Lambertville to Point Pleasant and including those two towns.

G. L. COPPAGE, Pusey and Jones Corp., Wilmington, Del.
B. H. JOHNSON, R. D. Wood & Co., Florence, N. J.
L. W. MESTA, Mesta Machine Co., Pittsburgh.
A. HUNTER WILLIS, National-Erie Co., Erie, Pa.
S. F. WORKMAN, Frick Co., Waynesboro, Pa.
Lower Peninsula of Michigan, Ohio, Kentucky, Indiana and West Virginia
L. W. OLSON, Ohio Brass Co., Mansfield, Ohio.
E. A. LEARY, Cincinnati Steel Castings Co., Cincinnati.
O. A. SEYFERTH, West Michigan Steel Foundry Co., Muskegon, Mich.
L. H. LINK, Bass Foundry & Machine Co., Fort Wayne, Ind.
RALPH H. WEST, West Steel Casting Co., Cleveland.
Illinois, Missouri, Oklahoma, Kansas, Nebraska and Iowa.
C. N. STONE, Deere & Co., Moline, Ill.
J. W. BETTENDORF, Bettendorf Co., Bettendorf, Iowa.

J. P. O'NEIL, Western Foundry Co., Chicago.
KENNETH GREEN, Green Foundry Co., St. Louis.
L. L. MUNN, Arcade Mfg. Co., Freeport, Ill.
Wisconsin, Minnesota, Upper Peninsula of Michigan, North Dakota, South Dakota and Manitoba, Canada.
FRED S. POWER, St. Paul Foundry Co., St. Paul, Minn.
E. C. BAYERLEIN, Nordberg Mfg. Co., Milwaukee.
CLARENCE R. FALK, Falk Corp., Milwaukee.
W. C. HEATH, Fairbanks, Morse & Co., Beloit, Wis.
F. H. CLAUSEN, Van Brunt Mfg. Co., Horicon, Wis.
Virginia, North and South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Texas and Tennessee.
R. C. STEBERT, Hardie-Tynes Mfg. Co., Birmingham.
CHAS. S. BARRY, Murray Co., Dallas, Tex.
W. D. MOORE, American Cast Iron Pipe Co., Birmingham.
HOUSTON DUDLEY, Gray & Dudley Co., Nashville, Tenn.
W. C. TROUT, Lufkin Foundry & Machine Co., Lufkin, Tex.

Open-Hearth Operators Talk Over the Problem of Making Good Steel

MORE than one hundred men, open-hearth operators and others, gathered at the Hotel Cleveland, in Cleveland, Nov. 20, for the thirteenth semi-annual session of the Open-Hearth Conference — a group of the iron and steel division of the American Institute of Mining and Metallurgical Engineers. Total registration in the two-day meeting was 139.

As has been the case in these meetings for several years, there were no set papers. There were, however, several prepared committee reports. Discussion was general and, at times, lively. The program was divided into three general sessions, devoted respectively to open-hearth operation, combustion control, and quality control. Along with the control of combustion session came a discussion of refractories.

In opening the meeting Leo F. Reinartz, works manager, American Rolling Mill Co., who has been chairman of the conference for several years, stated that the growing size of the gatherings and the interest shown in the topics discussed was most gratifying. He reported the conference on a sound financial basis.

In closing the third session of the meeting the chairman announced that it was proposed at the next spring meeting to have discussed the general subject of personnel relations as applied to steel mill practice. The personnel director of one of the member companies, which has been in the forefront along this general line, will speak to the operators on this subject, outlining what his company has done and making general recommendations looking to the betterment of personnel conditions throughout the industry.

On the afternoon of Nov. 21, after the three half-day technical sessions, the members of the conference visited the plant of the Corrigan-McKinney Steel Co., where they witnessed the tapping of a 225-ton heat of high-phosphorus steel through a bifurcated spout into two ladles of elliptical cross-section. This steel was teemed, at two platforms, into about sixty-five 8000-lb. fluted ingots of circular cross-section, with brick hot-tops. The molds and stools had been coated with tar through the dipping process, which is common practice in this plant.

Taking up the technical business of the sessions, the chairman called upon various open-hearth operators and others to lead the discussion on the

successive topics on the program. These topics numbered 39 or 40 and most of them were reached before adjournment. In the succeeding paragraphs and in later issues of *THE IRON AGE* the principal points brought out in these discussions are set forth.

Superheated Steam for Atomization of Oil

ONE operator, using superheated steam at about 650 deg. Fahr., reported a saving of about 2 gal. of oil to the ton of steel, compared with the use of steam for atomizing but without superheat. His superheaters are placed in the flue just ahead of the damper, and he has never lost one through burning out. A by-pass is available for use at times when the superheater is not needed.

Another operator has steam taken from his waste-heat boilers, which are so close to the furnaces that he gets a steam temperature of 500 deg. without superheat. He reported that, when the steam is not in use, the furnace shows a decided slackening in rate of operation. A small measure of economy was reported by another man, who uses a superheat of nearly 100 deg. but who reported that his boilers were so far from the furnace that his final temperature, including superheat, runs only about 370 deg.

In another case superheat up to 1000 deg. was tried. This proved successful to the extent of saving about 1 gal. in oil consumption, but it was felt that the temperature was too high for safe operation, and it was reduced to 650 deg., at which a saving of $\frac{1}{2}$ gal. is noted. This operator expressed the opinion that the advantages of superheating for this purpose are sometimes exaggerated, but he reported that at 1000 deg. there

was a saving of about 2c. a ton, because of the fact of using less steam.

Advantages of Superheat Questioned

A report made up by the Blaw-Knox Co. showed theoretical flame temperatures under conditions in which steam at 150 lb. pressure and air at 1800 deg. Fahr. was used. Four cases were discussed, having respectively steam with 5 per cent moisture, dry steam, steam with 50 deg. superheat, and with 150 deg. superheat. In the first instance, the theoretical flame temperature was about 4845 deg. With dry steam the figure was 4858 deg. This latter temperature was worked out also for both of the superheated conditions. These figures were found to prevail both at 2 lb. of steam and at 5 lb. of steam to the gallon of oil.

It was concluded that there is little advantage in superheat so far as flame temperature is concerned, beyond what could be obtained with dry steam. However, the fact of a small amount of superheat would insure having dry steam at the burner. A saving of 0.82 per cent was reported when 2 lb. of steam was used to the gallon of oil, and 1.15 per cent with 5 lb. There was a question, however, if the superheating itself made a direct saving.

These figures were worked out for a 100-ton furnace, with an hourly input of 65,000,000 B.t.u. The furnace was running 7200 hr. in the year. On this basis dry steam compared with steam with 5 per cent moisture gives about 1 per cent fuel economy, working out at about \$1,230 a year. But a still greater benefit was reported from an increased production by the furnace, and amounting to about twice this money gain.

Use of a Bifurcated Spout for Large Heats

AN operator having exceptionally large furnaces reported that most of the troubles with the bifurcated spout could be avoided by keeping the tapping hole of the furnace perfectly straight. Instead of having the hole dug out by men working entirely on one side, he now has men on both sides of the tap-hole and, as a result, seldom has to use his gate to equalize the amount of steel running into the two ladles.

Another operator, who uses a bifurcated spout for a furnace of 80



tons capacity, thus getting two ladles of 40 tons each, has not used a dam in several years. He does, however, have a control over the divided stream through using a short stopper rod, which can be raised or lowered or moved from side to side at will. The heads on this rod will last for several heats.

A third man reported the same device of stoppers in splitting his stream, but stated that much of the secret of his success lay in keeping the tap-hole straight. In this case a 250-ton heat is run into two 125-ton ladles.

Tilting versus Stationary Furnaces

ONLY one operating man present has tilting furnaces in his shop. He uses them because of the high phosphorus content (about 1.6 per cent) in his iron. This matter of phosphorus is so important that in certain grades of steel he runs as

many as three slags. About two-thirds of the total lime used is put in to make the initial slag, with the remainder on the two others. Under these conditions, the tilting furnace proves a most economical and satisfactory device.

This shop has ten 50-ton furnaces and two 100-ton furnaces, each of the latter being tapped into two 50-ton ladles. He finds that maintenance costs are a little higher than with stationary furnaces, because of greater refractory cost. He is, however, getting about 300 heats to the campaign, using a 15-in. roof on the large furnaces and 12-in. on the smaller.

A general report, from a man who had not had personal experience with tilting furnaces, indicated that the initial cost of installation is much higher. To offset this, the time required to make the heat is shorter and much of the sensible heat is saved. Part of the charge is put into the furnace and is being melted while

the slag line is being made up. In contrast with this, stationary furnaces have to be completely drained and much heat is lost. In European practice, where the phosphorus content of the iron is high, the tilting furnace is a distinct advantage.

Variation of Operating Cost with Size of Heat and Rate of Operation

LARGE heats were reported to give a decided saving in operating cost, and from several points of view. In the first place, there is less lime required for each ton of steel; less bottom material is needed; there is a greater outflow of steel hourly, and the labor cost is lower for each ton. One man reported about 1 lb. less of magnesite used to the ton with a large furnace than with one of half its size, and a considerable saving on labor.

He found little advantage in fuel

Magnetistroy Steel Plant in Urals to Produce 1,500,000 Tons a Year

DESCRIPTION of a new plant being built in Russia, under the supervision of Arthur G. McKee & Co., Cleveland, was given by A. H. Buhl of that company. This is the Magnetistroy plant, on the eastern slopes of the Ural Mountains and located alongside the Ural River. The projected ingot capacity of this plant was stated to be about 5 per cent of the entire United States capacity. Some of the difficulties were outlined, one being the fact that the extremely long winter results in a frost line 7 ft. underground.

Ore will be obtained for the most part from deposits about 4 miles away and several hundred feet above the plant. It will be mined from open pits and about 275,000,000 tons already has been outlined. This ore contains some 60 per cent Fe. It is expected that mining will proceed at the rate of about 130,000 tons a day. The fines, to the extent of perhaps 8000 tons a day, will be sintered.

Each blast furnace will measure 25 ft. in hearth diameter and 100 ft. high, and will turn out 1000 tons of pig iron a day. Half of the steel will be made by the Bessemer process and the rest by the open-hearth process. Each of these two departments will have two 600-ton mixers. There will be three 25-ton Bessemer vessels, which may be increased to four, if it is decided to duplex.

FURNACES ALONG AMERICAN LINES

Fourteen open-hearth furnaces are designed, with a capacity of 150 tons each. They will be expected to produce 1,500,000 tons of steel in a year. It is anticipated that the first ingots will be made about Jan. 1, 1932. Each furnace will have a bath 48 ft. long and 16 ft. wide, with maximum depth of 36 in. They will be fitted with sloping backwalls and will be in all respects along the lines of up-to-date American practice. The roofs will be 18 in. thick with 22½ in. ribs.

Preliminary studies of the charge for these furnaces show 201 tons going in for each heat. Of this total weight 43 per cent will be hot metal, 33 per cent scrap, 12 per cent ore, and 11 per cent lime-

stone, leaving 1 per cent for all else. Operating equipment includes four 225-ton ladle cranes, each with a 40-ton auxiliary hoist, and four 75-ton cranes over the charging floor.

Nearly 25,000 tons of steel will go into the open-hearth building, which is 1800 ft. long. The mold yard and stock building will be parallel with this, and of nearly the same length. The furnaces are far enough apart so that a space of 30 ft. separates bulkhead from bulkhead—two or three times usual American practice.

This distance between furnaces was demanded in the interests of better working conditions. It may be noted, however, that the plans call for the use of a considerable number of women among the workers, and that one of the provisions for them includes a place where nursing mothers can leave their babies.

TO MAKE MUCH USE OF BLAST FURNACE GAS

Blast furnace gas will be used, so far as possible, for metallurgical purposes. Much of the excess will be burned under boilers for producing electric power. The plant's electric station will have capacity of 275,000 kw. in five 55,000-kw. units. In addition, there will be a tie-in with the Ural hydroelectric development nearby.

Advantage was taken of something of a carte blanche in the design, to provide unusually deep open-hearth checkerwork. The checker brick will be laid 19 ft. above the rider tile. There will be 50 courses of brick, each 4½ x 4½ x 10½ in. The regenerators will be over 30 ft. long, with a width of 15 ft. in the air chamber and 9 ft. 9 in. in the gas chamber. Forced draft will be used for the air. Estimated temperatures attained will be 2100 deg. in the air chamber, 2300 deg. in the gas chamber, and about 800 deg. at the base of the stack.

It has been calculated that these furnaces will produce steel on about 4,250,000 B.t.u. to the ton of ingots. Credit from steam produced by waste-heat boilers should bring this figure down to about 3,850,000 B.t.u.

cost, however, or on repairs. He did report a larger tonnage of steel hourly and over a yearly operation. He obtained fewer heats to the campaign but more tonnage between general repairs. He is making 12 tons an hour on furnaces of 150 tons capacity; 15 tons on 250-ton furnaces; and from 17 to 18 tons an hour on 350-ton furnaces.

Another man reported decreased costs of the order of almost 12 per cent from an increase of 10 per cent in the size of furnace. This figure was questioned by others, who reported that the decrease in cost was customarily about one-third of the percentage increase in size of furnace. In one such case, costs of operation were reported to have been dropped by 8 to 10 per cent, with an increase of 25 to 30 per cent in output.

In another case, however, a 10 per cent saving was stated to have accompanied an increase in furnace size from 95 to 105 tons. Present output from these furnaces is about 8.1 tons an hour, which is 10 per cent higher than before. The rebuild cost is about the same in the two instances, as is also the fuel cost. Labor costs, however, are down, because of the prevalence of higher tonnage rates on the smaller furnaces.

One plant, where the furnaces were enlarged from 70 tons to 80 tons, found a 5 per cent saving. In another case, where the bath was increased in length by 4 ft. and the heat went up from 50 to 75 tons, the 75-ton heat is made just as fast as was the 50-ton heat before. There are five doors in the furnace against three, which fact facilitates working the heat.

Effect of Business Conditions on Costs

Another phase of this topic had to do with operating costs at a low rate of operation in the shop. Contrary to expectation, one man reported lower costs with two furnaces running than when four were running. He attributed this difference, however, to the fact that under present conditions there is a pinching of costs everywhere all along the line. Another report showed that there was an increase of 7.27 per cent in one shop's unit costs when the operating rate was reduced by 44 per cent. In another plant operating costs went up 73c. a ton when the average number of furnaces in operation was reduced from 10.7 to 8.1, over a month's run.

In one case costs were said to be about the same to a ton from full operation all the way down to about 40 per cent operation. Below that it is necessary to pay labor a higher rate if it is to make a living wage and, consequently, the costs run up.

Speed of Operation with Varying Hot-Metal Percentage

ONE man reported a gain of an hour in time of making a heat when a high percentage of hot metal is used in place of a high percentage

“WHEN Greek meets Greek, then comes the tug of war.” So it is with the open-hearth operators. Not content with packing their “experience” meetings full of the most practical kind of discussion of their highly technical problems, they insist on talking shop at lunch and at dinner, and whenever a group meets in the corridor or elsewhere.

In these pages is a portion of the discussion which took place at Cleveland last week. More will appear in succeeding issues. It was the general feeling of those present that this was the most satisfactory meeting, from the point of view of information exchanged, of all those which have been held.

of scrap. Another man, however, reported not quite so good a time record when the hot metal was up to 60 per cent, compared with the more usual 45 per cent.

A Canadian operator said that 45 to 55 per cent of hot metal was found the most economical range in his plant. When only 30 per cent of pig iron is used, he found no advantage in hot metal compared with cold metal. Thirty successive heats with 30 per cent of pig iron and 70 per cent of scrap ran at an average rate of 15 tons an hour. The bigger the furnace, the more difficult this man found it to be to run with cold metal.

A question was raised as to the relation between speeds with part hot metal and part cold metal, when the same total pig iron is used with relation to the scrap. A specific case was brought up in which the charge amounts to 325,000 lb., of which 195,000 lb. was scrap and 130,000 lb. pig iron. Fastest time was made with the pig iron all hot. About one hour longer was required with the pig iron half cold and half hot. With all cold iron, the heat took about 2 hr. longer than when all hot. It was brought out, however, that a part of this loss of time was due to the fact that it takes much longer to charge cold iron than hot iron.

Another operating man reported using 40 per cent pig iron and getting an operating rate of 10.52 tons an hour from tap to tap, when three-fifths of his pig iron was hot and the remainder cold. This compares with only 8.39 tons an hour when using 45 per cent pig iron, all cold. The loss in operating rate was figured at 20.34 per cent. To put it another way, the heat took 26 per cent longer time to make. There was no gain in ingot yield, and the lime required went up from 8½ per cent to 9½ per cent.

Another man reported that it takes him 3 hr. longer to make a heat from cold stock in an 80-ton furnace and that he uses more pig iron to do so. His operating rate dropped from 8.5 to 6.2 tons an hour under these conditions. Still another man, compar-

ing furnaces at about the same stage in their useful life and making steel about the same, with 0.12 per cent carbon, made comparisons between 46 per cent hot metal and 54 per cent scrap; 22 per cent hot metal, 28 per cent cold metal and 50 per cent scrap; and 51 per cent cold metal and 49 per cent scrap. In each case the lime was 12½ per cent.

With the hot metal the heats averaged 9¼ to 10 hr.; with the mixed hot and cold it was 11 hr., and with the cold metal 12½ hr. Similar results were achieved by another man, who reported a 20 per cent gain in time when using 40 per cent hot metal and 60 per cent scrap, compared with 50 per cent of cold metal and a similar amount of scrap. About half this gain was made when 22½ per cent hot metal, 22½ per cent cold and 55 per cent scrap were used.

Increasing Size of Ladles

DEVELOPMENT of hot metal ladles and of steel pouring ladles was traced by Mr. Hamilton, of the Treadwell Engineering Co. As recently as ten years ago there were practically no hot-metal ladles of over 60-ton capacity and steel ladles were limited to about 120 tons. In 1920 a hot-metal ladle of the mixer type, of 80 tons' capacity, was in use. From this the advance was up to 100 tons, then 125 tons, and finally the present maximum of 150 tons. Such a ladle of 175 tons is now under design but has not yet been built.

Figures given are the capacities of the ladles when new or after a new lining is put in. The nominal figure is increased in practice by as much as 15 per cent as the lining gradually wears. The open-hearth department has been found to profit by the use of these larger units, particularly where the plant consists of a small number of open-hearth furnaces, without a mixer. These ladles have a hot-metal supply always available, and obviate all need for using cold pig iron. Modern practice has got away from skulking losses in the small units.

Open-hearth steel ladles have gone up in size in somewhat the same

manner. In this development, however, it has been necessary to design the ladles to keep away from an excessive ferrostatic head. In emptying such a ladle of large size, frequently two stoppers are useful.

In enlarging ladles for use in shops where the crane hooks must be kept at a fixed distance apart it has sometimes been necessary, in avoiding excess height, to change the ladle section from circular to elliptical, with the minor axis of the ellipse equal to the previous diameter of the circle. Such eccentricity has attained a maximum so far of 3 ft. 9 in.

Large ladles of this type, reaching 175 tons' capacity, have been fitted with trunnions of 18-in. diameter and 10-in. face, made of plain carbon steel. In some cases where the ladle crane hooks had to be retained at previous trunnion dimensions, limiting the size of trunnions on the new ladles, alloy steel has been used for this purpose, some of it going as high as 3 per cent nickel. The slope across the bottom of the ladle is about 6 in. in large units, regardless of the exact diameter.

Hotter Metal from Mixer Car

Metal from a mixer car can be maintained hotter than that from a mixer. In one plant last year, when it was running at full capacity, about two-thirds of the metal used in the open-hearth was handled in mixer cars, never going through the regular mixer at all.

Discussion on this talk by Mr. Hamilton brought out the fact that practice varies widely with regard to the tonnage which can be handled for each lining on a mixer car. In one case, where the haul is about 12 miles and the iron is required to be especially hot, about 40,000 to 45,000 tons is the practice. These figures are much below what has been obtained in other plants, however. In many cases from 100,000 to 150,000 tons can be handled before it is necessary to reline the ladle. In one case the tonnage ran over 300,000.

One operator using such a ladle reported 97,000 tons average on a lining of sandstone and 157,000 tons with firebrick lining. He reported that the rate at which the plant is operating makes considerable change in this figure. He tries to run his car with about 300 to 350 tons of iron a day. If more is handled, the car will burn out faster. When he runs as low as 250 tons, a certain amount of skull sticks to the lining and builds it up. It can then be cut out by running the car for a while at a considerably faster tonnage rate. Deliberate operation in this manner might make a lining last almost indefinitely.

Deep Slag Pockets

ONE operator has deepened the slag pockets in connection with the use of sloping backwalls in seven furnaces. He reports a much better practice insofar as necessity to change the division wall is concerned. Under

the older practice, he had to change this wall after every two runs of the furnace and sometimes oftener; with the deep pockets, however, the wall has lasted through four campaigns.

Development of Refractories

DISCUSSING the question of open-hearth refractories suitable for use with temperatures of 3500 to 4000 deg. Fahr., a representative of one of the refractories companies reported that this material has not yet been perfected. Giving the refractory a very high melting point produces in it a greater tendency to spall and fail through squeezing under pressure. For these reasons such a refractory has not yet been made practical.

Progress has resulted, however, in better silica brick and better workmanship is going into them. Improvements have been made in the blends of ganister rock in making up the mix for the brick.

Stress was laid upon the necessity of having the rise of the roof arch properly proportioned to the span. In particular the angle of the skewback must be correct for taking the thrust in the proper manner.

Refractories with high alumina content have been used extensively for water-cooled ports. Recently they have been laid in the upper courses of open-hearth regenerators through a distance of perhaps 4 ft. Their use in this position was said to avoid necessity for cleaning, and fusion and clogging both were said to be eliminated. Such a construction gave about twice the previous run.

Quick-set magnesite for making hot patches was reported satisfactory. High-temperature cement used in the brickwork in the ports was said to be of help because the outgoing gas does not cut through them so quickly. The same is true in regenerators.

(To be continued)

Thin Gages of Strip by Pack Rolling in Continuous Mill

FROM a slab to a strip of sheet gage thickness in the one heating—this has been accomplished at the Riverdale Works of the Acme Steel Co., Chicago. It is the outcome of experiments conducted at various times over a period of years. The results are regarded as showing a way of rolling sheets as well as strips without reheating.

The process is of course protected by patents apparently held jointly by Lloyd Jones, manager of the Salem (Ohio) Works of the E. W. Bliss Co., and the Acme Steel Co. The Acme company does not plan to proceed with the rolling of wide material, and some weeks ago it entertained a large number of steel mill officials in a demonstration presumably in part to interest others actively in adopting the Jones-Acme process in all its aspects.

The rolling under the Jones system is a modification of the continuous production of strips. Between the six roughing stands and the remaining six finishing stands at Riverdale, the strip is doubled and then continues as a pack of two strips through the finishing stands. On delivery to the hot bed, the two strips are separated.

Interest lies in the devices for effecting the doubling without checking the speed of the mill, in the steps taken to prevent sticking of the pack and in the method of keeping the two strips of the pack accurately one above the other so both will receive reduction in thickness over the entire width in each pass and incidentally so that cobbles will be minimized, if not avoided. From start to finish about one minute elapsed between the delivery of the steel from the furnace and the run-out on the hot bed, with a finishing speed of 1600 ft. per min.

As the forward end of the strip issues from the last stand of the roughing train, it trips a pair of gripping jaws. These hold the end fast with the result that the continuing

forward movement of the strip on the roller table produces a flat loop. When the tail end of strip appears, the jaws are released and the doubled strip or loop is pressed still flatter by manual labor, so that it may be fed immediately into a series of guiding rollers which deliver it, now a pack of two, to the finishing stands.

At the point of emergence from the roughing train, the hot strip is given a dusting of soda ash. This is the material that was finally adopted to prevent the sticking. The soda ash is sifted from a shallow screen-bottomed box supported immediately beyond the last stand of the roughing train. After the passage of each strip, the attendant shovels the proper amount of ash into the box, which is agitated as the strip is in rapid passage underneath it.

The success in getting the two parts of the pack one above the other comes from the use of pony edgers, which press against the edges of the two strips and which are set so that they are about 1/32 in. closer together than the narrowest probable width of the strips. There are five of these edgers (with concave rollers), mounted in advance of the last five stands and feeding directly into the stationary guides at each stand.

For separating the packs at the time of the visit, the end of one of the completed strips was wedged into an opening of the hot bed, and the corresponding end of the mating strip was attached to the hook of the traveling crane and the crane in its travel made to do the work of stripping. For the demonstration, strips 9½ in. wide were being rolled to a thickness of 0.028 in. It was stated that the process has been applied at some other strip mill for widths of 20 in., and it is regarded as practical for "the rolling of strip sheets, two ply, down to gages approximating 0.020 in. and perhaps lighter."

Readjustment Under Way, But Incomplete

BY LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

FAVORABLE FACTORS

1. Department store sales increased in October.
2. Merchandise imports gained in October.
3. Domestic copper shipments rose in the same month.
4. Unfilled orders for cotton cloth increased more than seasonally and stocks declined.
5. A little progress was made in liquidating collateral loans.
6. Retail prices are being readjusted.
7. Production curtailment is working to bring supply into adjustment with demand.
8. A considerable number of basic commodities show stable prices; a small rally in scrap.
9. The liquid condition of most mercantile lines, low brokers' loans, and low open-market money rate.

UNFAVORABLE FACTORS

1. Commodity prices continue to decline, including raw materials, as a group, and pig iron.
2. The P-V line down in October and below normal.
3. Unfilled steel orders made a less than seasonal gain in spite of small shipments.
4. Machine tool orders at a new low in October.
5. Decline in factory employment and payrolls unchecked.
6. Continued decline in exports; disturbed and uncertain conditions abroad.
7. No reduction in large stocks of copper, lead, zinc and many other products.
8. Building activity very low and down in October.
9. Automobile industry depressed.
10. Much frozen credit and numerous bank failures.
11. Stock and bond markets still weak.

CHIEF of the changes from a month ago are the resumption of the declining trend in employment and payrolls, in building activity, and in machine tool orders. There was also a more than seasonal gain in department store sales, but the most fundamental favorable developments lie in the progress made toward completing the necessary liquidation and readjustments which must precede sound stabilization.

Few, if any, really new factors have developed, either favorable or unfavorable—merely relapses in several cases in which a possible turn for the better had been indicated by September data. The balance between favorable and unfavorable factors, with due regard to their relative importance, appears to remain distinctly on the unfavorable side. October figures show a new low in industrial activity, and suggest some further recession. Shortages are still "in the making," not made. Stocks of basic commodities remain abnormally high. While some evidence exists that more commodity markets are becoming stable, most still show declines and the Bureau of Labor Statistics index of raw material prices fell in October.

Our P-V line (a ratio of commodity prices to physical volume) appears to be resuming its gradual decline. The August index pointed upward, preceding some small and scattered gains in business, but it was off again in September and October, though not enough to affect much the moving average shown in the chart. The October preliminary index is 89.5, against 89.6 in September. It thus remains below normal, which is estimated at about 92.

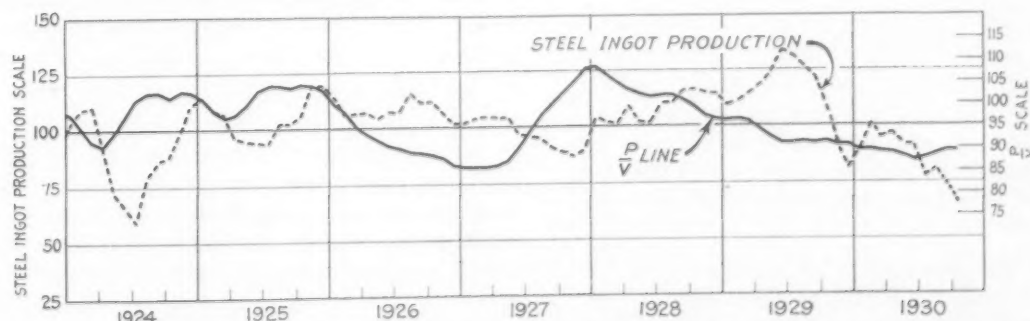
Such long declines in both volume and price as have been occurring are found only in major recessions and depressions. They probably mean a progressive lowering of buyers' demand schedules, and suggest further reductions in prices of finished products and in retail prices. But the prolonged, irregular, sidewise movement of the P-V line at its present low level indicates that substantial progress is being made in readjustment of supply and demand conditions, through curtailment of production and lower prices.

This readjustment is what is required, and is supplying a sound basis for gradual stabilization and ultimate business recovery.

There is, however, little likelihood of a termination in the decline of the P-V line until a recovery in commodity prices indicates that supply has finally been brought into equilibrium with demand. This will be indicated when the product, production \times prices, begins to rise, of which there was no indication in October, either in the steel industry or in the average of all industries.

The steel industry is so woven into the business fabric that it can hardly recover ahead of industry in general. Reason and precedent both indicate that steel production will probably not expand before the P-V line rises to normal.

What is now needed is further to readjust (1) prices of finished goods to the prices of raw materials, (2) retail prices to wholesale prices, and (3) the price of labor to the earnings of enterprise and to the cost of living. When these readjustments are accomplished, business can expand.



Further recession in the P-V line (here plotted on 3-month moving average) indicates a further postponement of the date of probable business recovery. Readjustment is proceeding slowly.

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

(ESTABLISHED 1855)

Stocks of Goods

THE stocks of goods existing in a country of complex culture, like the United States, is always large. Quantitative information is no more than shadowy; so much so that almost it may be said not to exist. About the only estimate is that ordinarily it may be of the order of 10 months' supply. This refers, of course, to a correlation between the national expenditure and the aggregate value of all goods on hand.

In respect to commodities that pass into consumption by short and direct channels the normal supply is naturally less than a 10 months' requirement. In respect to those that pass into consumption by long and complicated channels it may be more. The minimum occurs in perishable commodities that pass directly to consumption without undergoing any process of manufacture, such as some kinds of food. The maximum occurs in slow-moving commodities that undergo complicated processes. The movement of metals toward final distribution through retailers of hardware exemplifies the latter condition.

It is clear therefore that the stocks of commodities that are statistically reported as being in the hands of the producers, which may be described as visible, are never more than a part of the whole. Between the primary producer and the final discharge into consumption there are myriads of channels and reservoirs, in which there are supplies far greater than is commonly imagined. Such supplies, which may be described as the invisible, are not confined to speculative accumulations, or even to working reserves, but include the quantities that are undergoing fabrication, perhaps through a chain of processes, and are in transit, and finally appear in the warehouses of jobbers and on the shelves of retailers, awaiting distribution. Some researches into this subject that have been made have indicated that the stocks of retailers average something like three to four months of consumption.

In a period of liquidation there is a tendency to contract such stocks, in other words, to reduce inventories. If producers do not adjust themselves quickly to conditions stocks may back up in primary hands. Such occurrences do not necessarily imply a maladjustment of production and consumption, but they may reflect what is in effect a transfer of invisible stock into visible.

It is clear that processes of this nature have been in operation during 1930, just as they were in 1921. In no other way is there reconciliation of discrepancies between statistics of deliveries for consumption and discharge for final consumption in the few industries for which such statistics are available. Nor can we refuse to accept the deduction that improvement in the business of producers will start with the resto-

ration of confidence that leads to the replenishment of stocks in the manufacturing and distributive system rather than the awaiting of improvement in consumption. With such a start employment will increase and *ipso facto* consumptive demand will increase also.

In looking at the stocks reported in the hands of producers we are consequently never seeing more than a part of the picture. When we are in a condition of normal equilibrium such a partial view may be sufficient for guidance. In a condition of unbalance it may not be so at all. In the absence of quantitative data in respect to the great invisible, timed forecasts are futile. It is impossible to do otherwise than guess when the most important factor is unknown.

The prognosis of business revival may be correct in principle, but to prophesy that the turn is going to occur in December or January or any specific month is idle. Our economic pictures are indeed so obscure that we may not be conscious of a turn of the tide until a considerable time after it has turned. If, however, we are sure that the fundamental conditions are sound, we may also be sure of a turn of the tide. There is no present reason to believe that in America the fundamentals are otherwise than sound.

Concentrating on Selling

EACH dark day of business depression brings to light some new cause of our present troubles. The accumulating evidence of maladjustment is as impressive as that which supported the "new era" theory in the palmy days before the stock market crash. Everything seems to be out of joint, and the American manufacturer, after repeated disappointments, has lost faith in predictions that recovery is "just around the corner." Although by no means indifferent to the revelation of new facts bearing on the general state of trade, he has given up waiting for a turn of the cycle and is concentrating on capitalizing the facts relating to his own particular business. Forced to fall back on self reliance and individual resourcefulness, he has grown weary of the outpourings of economic soothsayers and skeptical of the many remedies they suggest.

He has remained singularly unmoved and unresponsive even after the widely quoted address of that eminent financier, Thomas W. Lamont. Whether rightly or wrongly, Mr. Lamont's criticism of the tariff is discounted because of his house's large stake in the business enterprise of Europe. The speaker's condemnation of artificial restraints on the prices of rubber, copper, coffee and other commodities is seen out of harmony with his espousal of a modification of our anti-trust legislation. The importance Mr. Lamont attaches to psychological influences on business is not disputed, but his warn-

ing against the danger of "overstimulating ailing business" is regarded as unwarranted.

The American manufacturer can see little risk of overstimulating trade at a time when fear and uncertainty are accentuating the conservatism of buyers. The need of the time is to bring out that volume of business which is held back purely by psychological influences. Too much attention has been paid to the fact that public buying power has been crippled and too little to the amount of trade that is being restrained solely by the current state of mind. While there is no statistical measure of dammed up demands, it is agreed that they must be large and that they are steadily accumulating the longer the depression lasts. It is for this reason that manufacturers everywhere are focusing their attention on the selling problem.

One prerequisite of increased sales is confidence in prices and it was with the purpose of creating faith in present market levels that the Carnegie Steel Co. took the initiative in an effort to stabilize going quotations on plates, shapes and bars. This move was well timed and has a propitious background, since it comes in an industry in which competition has been free and deflation of prices has been severe. It is an evidence of courage which, if generally supported, may give the iron and steel trade the impetus needed to bring about a change in trend. It may well mark the turn in business psychology which will make buying increasingly responsive to energetic and intelligent selling.

Forced Measures for Employment

WHEN owing to maladjustments men in an industry are laid off, naturally it is the inferior who are dismissed. The project for reducing working hours or working days in order to afford employment for all contemplates a penalization of the good men. Furthermore, it contemplates a penalization of the employer, who would retain the best men for the sake of their superior efficiency.

A temporary expedient may be the institution of public works. If those be done to take advantage of materials and labor offered at low rates, and if credit conditions are proper, they are manifestly economically beneficial. Obviously the cost falls upon the taxpayers. If they be instituted for the purpose of hiring idle men at their own asking price, it is, of course, the taxpayer who has to pay.

The institution of public improvements or the spreading of employment may be, therefore, at the cost of the taxpayers, or of the industrial employers, or of the better workman. In the last analysis it is a compromise between efficiency and inefficiency. Even so we can not complacently sit by and see the inefficient starve. The law of the survival of the fittest is cruel and in our sentimentalism we do not like cruelty. We do all that we can to avert it even if we ruin ourselves.

The degree of unemployment that exists in the United States is probably exaggerated. There is always an element that is habitually idle. There is now another element that is wilfully idle. We refer to those who, having come into the enjoyment of

extraordinarily high dollar wages, are unwilling to work for any less and are disregardful of the fact that a dollar now buys more than it did a year ago. The producer sees demand contracting and shudders to think of capital charges that may ruin him. The laboring man has no capital charges and if he be able to obtain work for only two days a week may demand a higher rate and get away with it.

The labor leaders parade concern about unemployment because that is a part of their job. The politicians echo it because they have axes to grind. The sentimentalists aid and abet out of not knowing any better. Many of the present unemployed might become employed if they were willing to meet the market. America is still a long way from having its needful housing and improved conveniences.

Little Hope in Steel Cartel

IN a final effort to renew the Continental Steel Cartel, representatives of producers in the principal countries of Europe will gather in Paris on Dec. 5. Largely discredited among buyers and sellers as a means of market stabilization, the cartel may be prolonged until March 31, of next year, but the high hopes held for it in 1926 when it was formed have not been and probably never will be realized.

Established as a super-organization to fix a maximum of production for its members and allocate percentages of this production to the member countries and individual mills, penalizing those who overproduced with fines on a tonnage basis, it has signally failed to regulate output. When Germany, soon after the cartel was formed, encountered unusually heavy domestic demand and continued export activity for steel, the German mills unhesitatingly exceeded their tonnage allotments established quarterly, and paid the assessed fines.

Almost from the inception of the cartel, the German members urged that the only adequate solution of the problem of controlling prices and regulating competition was formation of international selling syndicates, which would dispose of the semi-finished and finished products of the cartel members.

Protracted negotiations by members of the cartel finally culminated in 1930 in the establishment of an international sales office for semi-finished material, bars and beams, and headquarters were opened in Paris and in Liège, Belgium. Before these offices had begun to function as exclusive selling agencies, discord developed among the members and preliminary activities of the syndicate were limited to fixing minimum selling prices on the products that it had been intended it should sell.

Instead of making a sincere effort to support the central selling organization, as a means of obtaining more profitable prices, the individual mills apparently applied themselves unsparingly to the problem of circumventing the price regulation of the syndicate. Sales were billed at the full established prices, but with oral understanding that certain claims were to be made by the buyer on receipt of the shipment and that these claims would be allowed by the seller without recourse to arbitration or other procedure.

Such methods engaged in by its own members, who

were doubtless influenced by the acute need of tonnage to maintain operations in a period of world depression, brought about the collapse of the selling organization a few weeks after its formation. Meanwhile the Continental Steel Cartel had lost further prestige as an agency of control and the European steel market was plunged into a period of price cutting from which it is only now emerging. So unprofitable did business become that certain mills withdrew entirely from the market, unwilling to incur further losses, as when bar prices receded to such levels as £3 18s. and £4 per metric ton (0.86c. and 0.88c. per lb.), f.o.b. Antwerp.

The vicissitudes of the Continental Steel Cartel have demonstrated that agreements of producers to regulate output and prices are of little importance when the individual mills participating in an agreement have the opportunity to secure more tonnage than is permitted to them or are in need of orders at any price to "keep going." Control of the surplus productive capacity which European steel-making nations found themselves with at the end of the war would be highly desirable, but neither a Continental, nor an international, steel cartel appears to provide the solution.

IN steel the year 1930 looks like a 62 or 63 per cent year—not so good as the 68 per cent of 1924 but much better than the 37 of 1921. Between 40,000,000 and 41,000,000 tons of ingots is indicated at the moment for the output. Production for ten months is calculated by the American Iron and Steel Institute at 35,410,000 tons. If November and December, with 51 working days, average the October rate, this will mean 5,100,000 tons more, making a total of 40,500,000 tons. Adding 1 per cent for the electric steel ingots, the outside figure is 41,000,000 tons.

CORRESPONDENCE

Three-Day Weeks

To the Editor: Mr. Davenport's letter on the "Three-Day Week" (Nov. 13) touches on one of the most serious of our economic problems; and that is how to make the immediate exigencies of business tie up with the fundamental requirements of business as a whole. I am sure that as time goes on, and we get more experience and see more clearly, these two apparently conflicting viewpoints will more and more tend to become one.

When we come to think of putting an individual plant on to a three-day week, and turning out as much or paying as much, the problem is a bothersome one; but fundamentally the question of a three-day week is not a question of detailed shop policy, but a question of facing the actual facts. The three-day week or its equivalent is pretty nearly here now, whether we want it or not. Working hours are being continually shortened by various means, some of which are desirable and some of which are not.

Among the desirable ways are by the increasing age at which boys leave school to go to work, and the increasing custom of taking an annual vacation, which never used to apply to the ordinary workman but is now the general practice.

The undesirable methods of shortening working hours

are unfortunately much more numerous and much more effective. They include seasonal employment, the difficulty of getting a new job at 45 years of age or older, unemployment due to change or improvement in processes, mergers, etc., etc.; and most serious of all is the unemployment due to hard times. The three-day week is pretty nearly here if we translate it into the total working hours in the lifetime of the workman; but it is here in very distressing and unsatisfactory forms indeed if we take all the factors into consideration.

There is a further disturbance due when the present wasteful and expensive processes of distribution are put on to as efficient a basis as now obtains in manufacturing. When that takes place the problem will become acute.

So perhaps a clearer statement of the immediately pressing problem would be to make the present leisure better organized, better arranged and more enjoyable; and the initial point of attack seems to me to be the control of the business cycle, thereby also sustaining consumption. That it can be completely controlled is probably not to be hoped for, but we should be ashamed of ourselves if we make as bad a mess of the next period of prosperity as we did of the last one.

Mr. Davenport's references to a surfeit of foodstuffs in America and a dearth in China and India are pertinent and well taken; but the problem brought on by our increasing efficiency will never be solved if we wait until this can be done on a world-wide basis. The readjustment must first be made in and for our own country.

RALPH E. FLANDERS,

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Springfield, Vt.

Accurate Finish for Match Plate Patterns

To the Editor: May I take the liberty of commenting on Paul White's article in THE IRON AGE, Oct. 30, page 1214, on how to make accurate match plates?

Even assuming that he knows one or more shops where accurate work is produced by methods he describes, the methods are too difficult for the average pattern shop. You simply cannot drill perpendicular holes with an unsupported drill and, when the holes are not perpendicular to the plate, or what amounts to the same thing—perpendicular to the flat side of the half-pattern—then cope and drag cannot possibly register and you get "shift."

Shift, or rather the inaccuracy in the match plate that causes shift, is usually very difficult to measure, and I have never seen a pattern maker who could be depended upon to correct such an inaccuracy when it is less than 1/32 in. and that much shift looks very bad in some castings.

I hope in time to convince foundrymen that their salvation lies in getting a sprinkling of technicians into every foundry so that their problems can be intelligently handled, including pattern making. I have spent a fortune on patterns, nine-tenths of which was wasted. A practical foundryman needs simplicity, both for his own good and that of his customers, and a plate such as Mr. White illustrates and describes never can be as accurate as the semi-die cast plate, while costing from five to ten times as much. They are comparatively simple and easy to make, too, but it is a technique that must be learned by an intelligent, competent workman.

Name any detail of foundry operation that you care to and I will prove that it can be better and more cheaply done by the technician than the so-called practical workman. It should be obvious to any technical graduate that the experienced technician always wins over the practical man.

E. O. KEATOR.

Consulting Engineer.

* Dayton, Ohio.

Better Support Expected from Railroads, Motor Car Industry and Public Works

▲ ▲ ▲
UPTURN in January Now
Deemed Certain — Steel
Price Stabilization Move Con-
tinues — Scrap Off Again at
Pittsburgh
▼ ▼ ▼

SOME further expansion in demand from the railroads and the automobile industry and a piling up of construction projects, particularly public undertakings, have heightened the hopes of the iron and steel trade and have added force to current efforts to stabilize prices.

Steel production is increasingly irregular, with the average for the country down to 41 per cent, compared with 43 per cent a week ago, and additional weakness has cropped out in the scrap market, but the industry is reconciled to another month of low activity and is more confident in its predictions of an upturn in the New Year.

IT is realized that present pressure to keep down inventories, although precluding an immediate expansion of business, will be followed by more liberal specifications for stock in January. It is appreciated also that many construction and industrial programs now being launched cannot mature until next year. But there is general agreement that improvement is definitely in prospect.

The Chevrolet Motor Co. will build 75,000 cars in January, compared with 45,000 cars scheduled for this month and 45,000 to 50,000 for December. The increasing operations of this company and other makers bringing out new models will tend to offset expected year-end suspension by the rest of the motor car industry.

A prospective purchase of 50 barges and five tow boats by the Inland Waterways Corporation will result in the placing of 28,000 tons of plates, while bridges at Niagara Falls, N. Y., will call for 12,000 tons of steel. Structural projects that have come into the market in the past month total more than 250,000 tons. Awards for the week, at 43,000 tons, are the largest since late in October.

RAILROAD buying, although to date far behind the volume of a year ago, promises to be on a steadily growing scale. The Erie has bought 41,748 tons of rails and the Baltimore & Ohio has definitely allocated orders for 75,000 tons, the informal placing of which was announced some time ago. The Chicago Great Western has purchased 300 hopper cars, the Santa Fe has closed bids on 1500 cars, the Northern Pacific has undertaken the rebuilding of 3000 cars in its own shops and the Missouri Pacific has started an extensive car repair program. An inquiry for 50 locomotives issued by the New York Central will be followed by requests for figures on 5000 cars. The Interborough Rapid Transit Co., New York, will shortly place orders for 289 subway cars.

Much of the rail and car business placed by the

carriers will not affect mill operations until next year. Deliveries on the Erie rails, for example, are to extend from February to August, 1931. Nevertheless both Chicago and Pittsburgh report a current gain in rail specifications. In fact, heavier releases of rails and plates for pipe fabrication enabled Chicago producers to raise their ingot output slightly in the face of declining or unchanged operations in other districts.

EFFORTS to stabilize prices on lighter rolled products, like the prior move to firm up plates, shapes and bars, have been restricted in scope mainly to the elimination of irregularities. If the way is to be cleared for advances later on, it is felt that the first step must be more rigid adherence to current market quotations.

Prices announced by some of the leading producers of strips and sheets are unchanged from recent recognized levels with three outstanding exceptions. The quotation of 3c. a lb., Pittsburgh, on galvanized sheets is \$1 to \$2 a ton higher than has been obtainable on recent orders, while the minimum prices announced on automobile body sheets (3.30c. a lb., Pittsburgh) and on cold-rolled strip (2.25c. a lb., Pittsburgh or Cleveland) are \$2 a ton lower than the published figures of the past few weeks. Little first-quarter business has yet been booked at the revised prices.

Heavy melting scrap has declined 25c. a ton at Pittsburgh, St. Louis and Cleveland. Yet the old material markets generally are apathetic, with sentiment among both buyers and sellers operating to buoy up prices. The reduction on heavy melting grade at Pittsburgh came as the result of a purchase of 10,000 tons by a mill at \$13. The division of the order into four parts indicated the reluctance of dealers to take large tonnages at that figure. Only distress material can be picked up by the scrap trade at less than \$12.50, and consumers are evincing more interest in purchasing scrap as an investment.

INVESTMENT buying accounts for much of the recent activity in pig iron. Sales at Chicago are the largest of the year, and purchases were in fair volume at New York, but evidences of actual expansion in foundry operations are largely lacking except among some of the melters serving the automobile industry.

THE IRON AGE composite price for scrap has declined from \$11.67 to \$11.58 a gross ton, and is now \$2.59 lower than a year ago. The pig iron composite has dipped from \$16.13 to \$16.11 a gross ton, comparing with \$18.29 twelve months ago. Finished steel, at 2.135c. a lb. for the seventh week, compares with 2.362c. one year ago.

PITTSBURGH

Price Stabilization Movement Gains Headway in Sheets and Strip

PITTSBURGH, Nov. 25.—The most favorable developments in the steel trade this week are in the form of further attempts at price stabilization and in the growing prospect of heavier steel buying after the first of the year. The current picture continues very discouraging, and it now appears that operations will not reach their low point until next month. Steel ingot operations have dropped to a little more than 40 per cent of capacity, and three steel company blast furnaces have been blown out. Finishing mill activity is also declining, the only exception to the trend being the local rail mill, on which production is being stepped up gradually.

Railroad purchases and prospective buying continue to feature the market. During the week the allocation of 1931 rail requirements by the Baltimore & Ohio and the Erie were announced. The Baltimore & Ohio purchase of 75,000 tons is 10,000 tons less than last year, while the Erie order of 41,748 tons is about 5000 tons under the corresponding purchase for 1930. The Pennsylvania has not yet awarded the large tonnage of bars, plates and shapes on which it took bids last week, but Pittsburgh mills are expected to share heavily in this business.

The prospective purchase of 50 barges and five tow boats by the Inland Waterways Corp. will require approximately 28,000 tons of plates. Structural business has been rather quiet in the last week, although bids will be taken next month on a bridge over the Niagara River at Grand Island, which will take about 12,000 tons of shapes.

The automobile industry has been taking steel in somewhat better volume during the last fortnight, but suspension of activity in principal automotive plants beginning early next month will cut down this outlet for steel, except possibly in the Chevrolet plants, until the new year. No change is reported in the volume of shipments to other principal steel consuming industries, most of which are buying on a hand-to-mouth basis in small lots.

Efforts to stabilize bars, plates and shapes at 1.60c., Pittsburgh, are apparently meeting with considerable success. The principal producers are adhering strictly to these prices, and some tonnage is being purchased on the supposition that an advance for first quarter might be made.

Sheet and strip prices for the next quarter are essentially unchanged from recent levels. Exception must be made in the case of galvanized sheets, on which principal makers are

Price stabilization movement grows, with naming of minimums on sheets and strip steel. Bars, shapes and plates firmer at 1.60c. a lb.

* * *

Current situation from tonnage standpoint is discouraging, though outlook for early 1931 improves.

* * *

Steel ingot operations have dropped to a little more than 40 per cent of capacity. Will not reach their low point until December.

* * *

Railroads contributing the outstanding orders, with slight gain from automobile industry.

* * *

Heavy melting scrap again declines.

now quoting 3c., Pittsburgh, as compared to a recent range of 2.90c. to 3c. Recognition of a 3.30c., Pittsburgh, price on auto body sheets amounts to a \$2 reduction on this product. On other flat-rolled products, recent minimum prices are being recognized, but leading mills are also continuing their efforts to get \$1 or \$2 a ton more, and the entire market is quoted at a range. Consumers have shown some interest in their first quarter sheet and strip requirements, but little contract business has been placed.

The pig iron market is still quiet, and little first quarter business is coming out. A merchant furnace has been blown in. Scrap has declined on the basis of a comparatively large purchase of No. 1 heavy melting steel by one mill at \$13.

Pig Iron

The Neville Island (Pittsburgh) furnace of the Davison Coke & Iron Co. went into blast last week after having been idle for about three months. This is the second merchant furnace to become active during November, and resumption of both stacks indicates the minimum stocks being carried by merchant interests. Shipments during November have been at approximately the same rate as last month, but new buying has been less noticeable. The Westinghouse Electric & Mfg. Co. is inquiring for the first quarter requirements of its Trafford City, Pa., and Cleveland plants. Otherwise, no general inquiry is before the market. Prices

are nominally unchanged at recent levels.

Prices per gross ton, f.o.b. Valley furnace:

Basic	\$17.00
Bessemer	17.50
Gray forge	16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.50
Low phos., copper free.....	\$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	\$17.50
No. 2 foundry	17.50
No. 3 foundry	17.00
Malleable	18.00
Bessemer	18.00

Freight rates to points in Pittsburgh district range from 63c. to \$1.13.

Semi-Finished Steel

Buyers of semi-finished steel have sufficient material under contract to extend into the next quarter, and are showing no interest in further requirements. Spot sales are lacking. The market on billets, slabs and sheet bars continues nominally at \$31, Pittsburgh. Forging billets are in light demand, but occasional sales are bringing \$36, Pittsburgh. Makers of wire rods have not opened their books for first quarter, but some of them are willing to take contracts at the present prevailing figure of \$36, Pittsburgh or Cleveland.

Bars, Plates and Shapes

Improved sentiment and more stable prices in the market for heavy hot-rolled products have not increased sales, and new business is very light. Railroads are accounting for most of the tonnage now under consideration. Pittsburgh mills will share in the purchases of the Pennsylvania Railroad, on which bids were taken Nov. 17. Mills in the district generally bid 1.60c., Pittsburgh, on bars, plates and shapes asked for, and the bids of Eastern producers were largely in line with this base. The prospect of additional car inquiry before the end of the year is good, but no actual inquiries are reported. Appropriation by the Federal Government for barges and tow boats for the Inland Waterways Corp. has been announced, and will result in inquiries for 50 barges and five tow boats some time next month. The barges will take 27,000 to 28,000 tons of plates, and the towing equipment about 1000 tons. This is the largest barge inquiry of the year, and may lead the way to considerable private buying soon after the holidays.

Structural awards in the past week have been light, and new inquiry is no longer so active. A bridge across the Niagara River at Grand Island, plans

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous,
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Nov. 25, 1930	Nov. 18, 1930	Oct. 28, 1930	Nov. 26, 1929
No. 2 fdy., Philadelphia.....	\$18.26	\$18.26	\$18.76	\$21.26
No. 2, Valley furnace.....	17.00	17.00	17.00	18.50
No. 2 Southern, Cin'tl.....	14.69	14.69	15.19	17.69
No. 2, Birmingham.....	14.00	14.00	14.00	14.50
No. 2 foundry, Chicago*.....	17.50	17.50	17.50	20.00
Basic, del'd eastern Pa.....	17.75	17.75	17.75	19.75
Basic, Valley furnace.....	17.00	17.00	17.00	18.50
Valley Bessemer, del'd P'gh..	19.26	19.26	19.26	20.76
Malleable, Chicago*.....	17.50	17.50	17.50	20.00
Malleable, Valley.....	17.50	17.50	17.50	19.00
L. S. charcoal, Chicago.....	27.04	27.04	27.04	27.04
Ferromanganese, furnace.....	94.00	94.00	94.00	105.00

Rails, Billets, etc., Per Gross Ton:	Nov. 25, 1930	Nov. 18, 1930	Oct. 28, 1930	Nov. 26, 1929
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh.	31.00	31.00	31.00	35.00
Sheet bars, Pittsburgh.....	31.00	31.00	31.00	35.00
Slabs, Pittsburgh.....	31.00	31.00	31.00	35.00
Forging billets, Pittsburgh...	36.00	36.00	36.00	40.00
Wire rods, Pittsburgh.....	36.00	36.00	36.00	40.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb....	1.60	1.60	1.60	1.85

Finished Steel,	Nov. 25, 1930	Nov. 18, 1930	Oct. 28, 1930	Nov. 26, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.60	1.60	1.60	1.90
Bars, Chicago.....	1.70	1.70	1.70	2.00
Bars, Cleveland.....	1.65	1.65	1.65	1.90
Bars, New York.....	1.93	1.93	1.93	2.24
Tank plates, Pittsburgh.....	1.60	1.60	1.60	1.90
Tank plates, Chicago.....	1.70	1.70	1.70	2.00
Tank plates, New York.....	1.88	1.88	1.88	2.17 1/2
Structural shapes, Pittsburgh.	1.60	1.60	1.60	1.90
Structural shapes, Chicago...	1.70	1.70	1.70	2.00
Structural shapes, New York.	1.85 1/2	1.85 1/2	1.85 1/2	2.09 1/2
Cold-finished bars, Pittsburgh	2.00	2.00	2.10	2.30
Hot-rolled strips, Pittsburgh.	1.55	1.55	1.60	1.90
Cold-rolled strips, Pittsburgh.	2.25	2.35	2.35	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel,	Nov. 25, 1930	Nov. 18, 1930	Oct. 28, 1930	Nov. 26, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh...	2.35	2.35	2.35	2.75
Sheets, black, No. 24, Chicago				
dist. mill.....	2.45	2.45	2.45	2.85
Sheets, galv., No. 24, P'gh...	2.95	2.95	2.95	3.40
Sheets, galv., No. 24, Chicago				
dist. mill.....	3.10	3.10	3.10	3.50
Sheets, blue, No. 13, P'gh...	2.05	2.05	2.05	2.25
Sheets, blue, No. 13, Chicago				
dist. mill.....	2.15	2.15	2.25	2.45
Wire nails, Pittsburgh.....	1.90	1.90	1.95	2.40
Wire nails, Chicago dist. mill.	2.00	2.00	2.05	2.45
Plain wire, Pittsburgh.....	2.30	2.30	2.30	2.40
Plain wire, Chicago dist. mill.	2.35	2.35	2.35	2.45
Barbed wire, galv., Pittsburgh	2.60	2.60	2.60	3.05
Barbed wire, galv., Chicago				
dist. mill.....	2.75	2.75	2.75	3.10
Tin plate, 100 lb. box, P'gh...	\$5.00	\$5.00	\$5.00	\$5.35

Old Material, Per Gross Ton:	Nov. 25, 1930	Nov. 18, 1930	Oct. 28, 1930	Nov. 26, 1929
Heavy melting steel, P'gh...	\$12.75	\$13.00	\$14.25	\$15.50
Heavy melting steel, Phila...	12.00	12.00	11.50	14.50
Heavy melting steel, Ch'go...	10.00	10.00	11.00	12.50
Carwheels, Chicago.....	11.75	11.75	12.50	13.50
Carwheels, Philadelphia.....	14.00	14.00	15.00	15.50
No. 1 cast, Pittsburgh.....	12.50	12.50	12.75	15.00
No. 1 cast, Philadelphia.....	12.00	12.00	13.00	15.50
No. 1 cast, Ch'go (net ton)...	9.50	9.50	10.00	12.50
No. 1 RR. wrot., Phila.....	13.50	13.50	14.00	15.50
No. 1 RR. wrot., Ch'go (net)...	8.50	8.50	9.00	12.00

Coke, Connellsville,	Nov. 25, 1930	Nov. 18, 1930	Oct. 28, 1930	Nov. 26, 1929
Per Net Ton at Oven:				
Furnace coke, prompt.....	\$2.50	\$2.50	\$2.60	\$2.65
Foundry coke, prompt.....	3.50	3.50	3.50	3.75

Metals,	Nov. 25, 1930	Nov. 18, 1930	Oct. 28, 1930	Nov. 26, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	12.12 1/2	12.12 1/2	9.62 1/2	18.12 1/2
Electrolytic copper, refinery..	10.25	10.75	9.25	17.75
Tin (Straits), New York.....	26.12 1/2	25.75	27.12 1/2	41.62 1/2
Zinc, East St. Louis.....	4.10	4.32 1/2	3.95	6.25
Zinc, New York.....	4.45	4.67 1/2	4.30	6.60
Lead, St. Louis.....	4.95	4.95	4.95	6.10
Lead, New York.....	5.10	5.10	5.10	6.25
Antimony (Asiatic), N. Y....	7.15	7.12 1/2	7.37 1/2	8.62 1/2

for which are out, will take about 12,000 tons of shapes. The superstructure of the South Tenth Street bridge across the Monongahela River at Pittsburgh is expected to come out for bids soon after Jan. 1. Fabricating shops in the district are still running on light schedules, and the plate requirements of makers of tanks and other fabricated products have declined recently. Demand for bars is very dull.

Railroad Equipment

The Baltimore & Ohio and the Erie have awarded their 1931 rail requirements of 75,000 tons and 41,748 tons, respectively. Of the Baltimore & Ohio tonnage, 46,000 tons went to the Carnegie Steel Co.; 5500 tons to the Illinois Steel Co.; 19,000 tons to the Bethlehem Steel Co., and 4500 tons to the Inland Steel Co. Of the Erie purchase, 21,698 tons went to Carnegie, 9650 tons to Illinois, 7200 tons to Bethlehem, and 3200 tons to Inland. The Baltimore & Ohio purchase is about 10,000 tons less than its 1930 total, while the Erie reduced its requirements about 5000 tons. The two largest Eastern roads have not yet made formal inquiry for their rail requirements. Purchases of track acces-

sories generally are being deferred, and specifications are also light. Pittsburgh district mills are now meeting the \$39 a ton price on tie plates, which has prevailed in Chicago for the last fortnight.

Cold-Finished Steel Bars

The market shows no marked change, although specifications of one or two makers have been slightly heavier in the last week. The price is rather uncertain, with some mills adhering to 2.10c., Pittsburgh, on the general run of orders, while others are meeting a 2c., Pittsburgh, price in competitive districts. No announcement regarding first quarter quotations has appeared.

Tubular Goods

While pipe line prospects for 1931 continue to show more promise, mills are rapidly completing orders booked earlier in the year, and the current situation is not favorable. Pipe mill production has generally declined during November, and even seamless units are not now running at more than 40 per cent of capacity in the Pittsburgh and Valley districts. On lapweld and butt weld material the average is even lower, while electric

welding units are engaged at a somewhat better rate. Demand for standard pipe continues dull, although the promise of improved building operations in the spring has given the market a better outlook. Mechanical tubing is quiet, and demand for oil country goods will decline even further if oil producers carry out their program for further curtailment in drilling operations. Pipe prices are fairly well maintained.

Wire Products

This market is very dull, and price weakness is a discouraging factor. Nails are generally quoted at \$1.90 to \$1.95 a keg, and merchant wire products in general have reflected the recent decline in nails. Jobbers are placing little new business, and demand from the manufacturing trade has fallen considerably under that of October. The price on manufacturers' wire is still quoted at 2.30c., Pittsburgh, although concessions of \$2 a ton are reported rather frequently in the Cleveland district.

Sheets

While sheet manufacturers have made no official announcement regarding first quarter prices, a number of

THE IRON AGE COMPOSITE PRICES

	Finished Steel	Pig Iron	Steel Scrap																																										
Nov. 25, 1930	2.135c. a Lb.	\$16.11 a Gross Ton	\$11.58 a Gross Ton																																										
One week ago	2.135c.	16.13	11.67																																										
One month ago	2.135c.	16.29	12.25																																										
One year ago	2.362c.	18.29	14.17																																										
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.																																										
	<table><tr><th>High</th><th>Low</th></tr><tr><td>1930..... 2.362c., Jan. 7;</td><td>2.135c., Oct. 14</td></tr><tr><td>1929..... 2.412c., April 2;</td><td>2.362c., Oct. 29</td></tr><tr><td>1928..... 2.391c., Dec. 11;</td><td>2.314c., Jan. 3</td></tr><tr><td>1927..... 2.453c., Jan. 4;</td><td>2.293c., Oct. 25</td></tr><tr><td>1926..... 2.453c., Jan. 5;</td><td>2.403c., May 18</td></tr><tr><td>1925..... 2.560c., Jan. 6;</td><td>2.396c., Aug. 18</td></tr></table>	High	Low	1930..... 2.362c., Jan. 7;	2.135c., Oct. 14	1929..... 2.412c., April 2;	2.362c., Oct. 29	1928..... 2.391c., Dec. 11;	2.314c., Jan. 3	1927..... 2.453c., Jan. 4;	2.293c., Oct. 25	1926..... 2.453c., Jan. 5;	2.403c., May 18	1925..... 2.560c., Jan. 6;	2.396c., Aug. 18	<table><tr><th>High</th><th>Low</th></tr><tr><td>\$18.21, Jan. 7;</td><td>\$16.11, Nov. 25</td></tr><tr><td>18.71, May 14;</td><td>18.21, Dec. 17</td></tr><tr><td>18.59, Nov. 27;</td><td>17.04, July 24</td></tr><tr><td>19.71, Jan. 4;</td><td>17.54, Nov. 1</td></tr><tr><td>21.54, Jan. 5;</td><td>19.46, July 13</td></tr><tr><td>22.50, Jan. 13;</td><td>18.96, July 7</td></tr></table>	High	Low	\$18.21, Jan. 7;	\$16.11, Nov. 25	18.71, May 14;	18.21, Dec. 17	18.59, Nov. 27;	17.04, July 24	19.71, Jan. 4;	17.54, Nov. 1	21.54, Jan. 5;	19.46, July 13	22.50, Jan. 13;	18.96, July 7	<table><tr><th>High</th><th>Low</th></tr><tr><td>\$15.00, Feb. 18;</td><td>\$11.58, Nov. 11</td></tr><tr><td>17.58, Jan. 29;</td><td>14.08, Dec. 3</td></tr><tr><td>16.50, Dec. 31;</td><td>13.08, July 2</td></tr><tr><td>15.25, Jan. 11;</td><td>13.08, Nov. 22</td></tr><tr><td>17.25, Jan. 5;</td><td>14.00, June 1</td></tr><tr><td>20.83, Jan. 13;</td><td>15.08, May 5</td></tr></table>	High	Low	\$15.00, Feb. 18;	\$11.58, Nov. 11	17.58, Jan. 29;	14.08, Dec. 3	16.50, Dec. 31;	13.08, July 2	15.25, Jan. 11;	13.08, Nov. 22	17.25, Jan. 5;	14.00, June 1	20.83, Jan. 13;	15.08, May 5
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companies have opened their books for this period at figures essentially unchanged from recent prevailing prices. Exceptions are made in the case of galvanized sheets, on which a number of makers are attempting to hold the market at 3c., Pittsburgh, with the \$2 a ton concession, which has become rather general, confined strictly to large jobbers. This may amount to an advance, but on automobile body sheets general recognition of the 3.30c. Pittsburgh price amounts to a \$2 a ton decline from recent quotations. Black sheets are unchanged at 2.35c. to 2.45c., Pittsburgh; light plates at 1.90c., and blue annealed sheets at 2.05c. Steel furniture sheets are fairly well maintained at 3.60c., and the other finishes are holding at recent levels.

While the failure of the market to advance has been rather disappointing to some makers, strict adherence to the above levels would prove rather encouraging, and probably lead to higher prices if business improved in the first quarter. However, no signs of an upturn are in evidence, and current specifications are very light. Suspensions of activity in the automobile industry are generally contemplated for a good part of December, and most of the steel to be used in automotive production next month has already been specified or shipped. A number of the other principal sheet-consuming industries are seasonably dormant, and consumption in general is on a strictly hand-to-mouth basis.

Tin Plate

Contracting for 1931 is proceeding rather slowly, as consumers are anxious to reduce present stocks and there is no immediate necessity for future covering. Current specifications are light, and, as the larger makers have not yet begun work on anticipated tonnage, operations show no improvement. The industry is running at about 40 per cent of capacity.

Strip Steel

Makers have opened their books for first quarter at unchanged prices. In some cases the figures are not well defined and one or two producers have announced their intention of adhering to 1.60c. and 1.70c., Pittsburgh, on

hot-rolled material and 2.35c., Pittsburgh, on cold-rolled. Others seem more willing to meet recent \$1 a ton concessions on the hot-rolled products, while recent spot sales of cold-rolled strip have been made at as low as 2.25c. Demand has not improved and is even lighter on some sizes. Operations range from about 20 per cent of capacity in the cold mills to 35 per cent in the hot-rolled departments.

Coke

Demand for heating coke has improved in the last week because of colder weather, but dealers are well stocked and increased consumer demand is not reflected quickly on producers' order books. Consumption of furnace coke promises to decline further in December, as three independent steel company furnaces are going out of blast. The price is unchanged at \$2.50, Connellsville. Foundry coke is quiet, with prices weak, except on the premium grades. No change has occurred in the coal

market except a slight improvement in domestic demand.

Old Material

Purchase of approximately 10,000 tons of No. 1 heavy melting steel by a Pittsburgh district mill last week at \$13 established this figure as the top of the market on that grade. The order was apparently divided among four dealers, and other sellers would have been willing to take small tonnages at the same level. However, the reluctance of dealers to take large tonnages at that figure indicates their belief that scrap prices are dragging bottom, and only distress lots can be picked up under \$12.50 at the present time. Some of the other grades are off slightly, reflecting the decline in heavy melting steel, but low phosphorus specialties seem somewhat stronger, and have been sold at over a rather wide range of prices. In some cases consumers are frankly buying for investment purposes, as operations are light and the majority of users of scrap have sufficient material on hand to last the remainder of the year.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:

No. 1 heavy melting steel..	\$12.50 to \$13.00
No. 2 heavy melting steel..	10.50 to 11.00
Scrap rails	12.00 to 12.50
Compressed sheet steel....	12.25 to 12.75
Bundled sheets, sides and ends	10.00 to 10.50
Cast iron carwheels.....	13.50 to 14.00
Sheet bar crops, ordinary..	13.50 to 14.00
Heavy breakable cast.....	9.00 to 9.50
No. 2 railroad wrought....	12.50 to 13.00
Hvy. steel axle turnings....	10.50 to 11.00
Machine shop turnings....	6.00 to 6.50

Acid Open-Hearth Grades:

Railr. knuckles and couplers	15.50 to 16.50
Railr. coil and leaf springs	15.50 to 16.50
Roller steel wheels.....	15.50 to 16.50

Low phos. billet and bloom ends	17.00 to 18.00
Low phos. mill plates....	15.00 to 16.00
Low phos. light grades....	15.00 to 16.00
Low phos. sheet bar crops	16.00 to 17.00
Heavy steel axle turnings.	10.50 to 11.00

Electric Furnace Grades:

Low phos. punchings.....	15.00 to 15.50
Heavy steel axle turnings.	10.50 to 11.00

Blast Furnace Grades:

Short shoveling steel turnings	7.50 to 8.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00

Rolling Mill Grades:

Steel car axles	18.00 to 18.50
Cupola Grades:	

No. 1 cast	12.00 to 13.00
Rails 3 ft. and under....	14.00 to 14.50

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes..	2.75c.
Reinforcing steel bars.....	2.75c.
Cold finished and screw stock—	
Rounds and hexagons.....	3.35c.
Squares and flats.....	3.85c.
Bands	3.10c.
Hoops	4.10c.
Black sheets (No. 24), 25 or more bundles	3.15c. to 3.25c.
Galv. sheets (No. 24), 25 or more bundles	3.75c. to 3.85c.
Light plates, blue annealed (No. 10), 1 to 24 plates.....	2.75c.
Blue annealed sheets (No. 13)....	2.65c.
Galv. corrug. sheets (No. 28), per square	4.25c.
Spikes, large	2.65c.
Small	3.05c. to 4.50c.
Boat	3.15c.
Track bolts, all sizes, per 100 count, 60 and 10 per cent off list	
Machine bolts, 100 count, 60 and 10 per cent off list	
Carriage bolts, 100 count, 60 and 10 per cent off list	
Nuts, all styles, 100 count, 60 and 10 per cent off list	
Large rivets, base per 100 lb. \$3.30	
Wire, black, soft ann'l'd, base per 100 lb.	\$2.40 to 2.50
Wire, galv. soft, base per 100 lb.	2.85 to 2.95
Common wire nails, per keg	2.25
Cement coated nails, per keg	2.45

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

CHICAGO

Steel Price Structure Gaining Stability— Pig Iron Sales Largest of Year

CHICAGO, Nov. 25.—The few changes that have occurred in the Western iron and steel market during the week have, for the most part, been of an encouraging character. Ingot output has gained slightly and is now at 45 per cent of capacity. The price structure, at least so far as the heavy tonnage products are concerned, has gained in stability and future requirements are assuming more importance in the minds of consumers. New buying of finished steel products showed no marked gain over the volume a week ago, but inquiries are more active. Specifications have grown for the third consecutive week, but it should be noted that rail releases are larger and pipe manufacture has taken a turn for the better. In fact, it is the latter type of business that largely accounts for the increase in ingot output. Several weeks ago Chicago plate mills were urgently in need of work, while now one mill is scheduled full for the remainder of the year.

Railroad equipment construction is steadily increasing its demand against steel mills. New orders to car builders call for 300 cars and 500 underframes. In addition, the railroads are building and reconstructing more cars in their own shops. The Missouri Pacific is building cars at several points along its line and the Northern Pacific is announcing a plan to rebuild 3000 cars at its various shops from St. Paul westward. No less encouraging are pig iron sales that mark this week as the best of the year. Consumption, however, shows only moderate gain over that of last month. The holidays and the inventory period are expected to reduce the melt in December.

Ferroalloys

The trade is still awaiting announcements of prices for the coming year. Consumption is light, and spot buying is at a very low point.

Pig Iron

Pig iron sales have been the largest for any week so far this year. Interest in first quarter is growing rapidly, especially among the larger users, and it is estimated that about 25 per cent of first quarter contracts are all ready on producers' books. Shipments in November will show only a slight gain over those of October. Specifications for December shipment are already reflecting the downward trend in melt which accompanies the holiday and inventory periods. Southern iron offered in this territory ranges in price from \$10.50 to \$11 a ton, Birmingham, depending on the tonnage. A few spot sales of silvery are reported

Influenced mostly by plate orders for pipe fabrication ingot output in district is slightly higher this week.

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Price structure gaining stability. Chicago makers of sheets and strip steel announce first quarter quotations.

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Pig iron sales the largest for any week so far this year.

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Scrap market remains weak, but price changes are fewer.

and several small inquiries are before the trade. The charcoal iron market is quiet.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	\$17.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.00
Malleable, not over 2.25 sil.	17.50
High phosphorus	17.50
Lake Super. charcoal, sil. 1.50	27.04
S'th'n No. 2 fdy.	17.51
Low phos., sil. 1 to 2 cop-per free	\$28.50 to 29.20
Silvery, sil. 8 per cent.	26.79
Bess. ferrosilicon, 14-15 per cent	35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Sheets

Producers are beginning to react against low prices now prevailing in this market. The Inland Steel Co. is naming several advances for first quarter business. The minimums at Chicago mills are 2.10c. a lb. for No. 10 blue annealed sheets, 2.25c. for No. 13 blue annealed, 2.55c. for black sheets and 3.10c. for galvanized. Ton-nages for delivery in the first quarter are moving at current prices, and it remains to be seen whether other sellers will follow the lead of the Inland Steel Co. in these advances. New buying and specifications are slightly lower, affording output in the range of 45 to 50 per cent of capacity. On the other hand, inquiry for next year's delivery is expanding and in this lies the opportunity for better prices.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.50c. to 2.60c.; No. 24 galv., 3.15c.; No. 10 blue ann'd, 2.05c. to 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Hot-Rolled Strip

Producers are naming first quarter prices at 1.70c. a lb., Chicago, for

strips wider than 6 in. and 1.80c. for strips 6 in. and narrower. Demand is running about even with last week's.

Cold-Rolled Strip

Books for first quarter have been opened at 2.35c. a lb., Cleveland, or 2.63c., delivered Chicago. Output is at 28 per cent of capacity.

Cast Iron Pipe

Rushville, Neb., has placed 9000 ft. of 4 and 6-in. pipe with the McWane Cast Iron Pipe Co. Duluth, Minn., has awarded 1500 tons of 4 to 16-in. pipe to an unnamed bidder. Chicago will buy 900 tons of 12-in. pipe for prompt delivery. Delphi, Ind., needs 1800 ft. of 10 or 12-in. pipe.

In the immediate Chicago district most of the old contracts have been specified in full. The Rocky Mountain region and the Northwest have been in the grip of a severe winter storm, and the time is close at hand when the ground will be frozen in the upper Mississippi Valley. Although some headway is reported on projects covered by bond issues approved at recent elections, it is doubtful if much of this work will reach foundry order books before spring.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, \$44 to \$46; 4-in., \$47 to \$48; Class A and gas pipe, \$3 extra.

Wire Products

Output remains in the range of 40 to 45 per cent of capacity. Specifications from the manufacturing trade are expanding slowly, this being especially true at automobile manufacturing centers. Jobbers' orders to mills measure well up to the volume of a week ago. The price structure is unstable, but there appears to be a desire among sellers to get away from concessions that have been made in recent weeks. Although 2.35c. a lb. is the general price on plain wire to the manufacturing trade, concessions of \$1 a ton have been made, and common wire nails have been sold as low as \$1.90 a keg, Chicago. Fluctuations in the copper market have prevented strengthening of the copper wire demand.

Rails and Track Supplies

The Baltimore & Ohio has ordered 75,000 tons of rails and the Erie has purchased 41,748 tons. The Illinois Steel Co. will roll 5500 tons for the Baltimore & Ohio and 9650 tons for the Erie. Counting the tonnage taken by Inland Steel Co., these two distributions have brought 22,850 tons of rails to Western makers' books.

The track accessory market is quiet, purchases in small lots having aggregated about 1600 tons in the last week. Specifications for standard-section rails are larger, affording a five-point output gain to 30 per cent of capacity. Orders for light rails are of carlot size.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, \$43; light rails, rolled from billets, \$36. Per lb.: Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 1.95c.; angle bars, 2.75c.

Reinforcing Bars

Prices in this market are again demoralized as a result of the extreme anxiety of sellers for tonnage. Dealers are no longer publishing quotations, and each project is keenly contested. A 200-ton order for billet steel reinforcing bars will not bring over 1.70c. a lb. out of warehouse. Rail steel bars for road work command 1.60c., but when this commodity is used for building purposes prices sink several dollars a ton. Shop operations, which ranged from 60 to 70 per cent of capacity last month, are now down to 45 to 50 per cent and all indications point to lower output in nearby weeks. Inquiries, which are usually for small tonnages, are 60 per cent of normal for November, but it frequently happens that inquiries do not develop into orders.

Bolts, Nuts and Rivets

Specifications for these commodities in November are only a shade higher than in October. Operations by manufacturers of farm equipment are spotty, some showing gains and others losses, the net result being that this industry has been giving little support to the bolt and nut industry. Sellers are preparing to offer contracts next week for the coming quarter. So far there has been no intimation of changes in prices.

Structural Material

This market is moving sluggishly, with awards at 2500 tons and fresh inquiry for not more than 8000 tons. The American Bridge Co. is reported to be low on 4000 tons for a bank at Oklahoma City and on 1100 tons for bridges in Missouri for the Milwaukee road.

Bars

Specifications for bar mill products this month are 20 per cent heavier than in October and are about equal to the volume in November of last year. The price is well established at 1.70c. a lb., Chicago. However, on shipments to outlying points there is a disposition among sellers to give the discount for cash on the delivered price rather than on the quotation at the mill before freight is added. New buying is practically at a standstill.

Little interest is being shown in rail steel bars for future delivery. Prices are seeking a 1.60c. a lb level,

thereby again establishing the \$2 differential which usually exists between rail and mild steel bars.

Plates

Recent releases of plates for pipe manufacture, in addition to a rather steady flow of orders for tank construction, have brought betterment to local plate mill schedules. In fact, one unit is now scheduled at full capacity to the end of the year. New orders for tank steel are small at 500 tons, but inquiries, emanating mostly from the Southwest, call for 15,000 tons. From all indications, the plate price is well established at 1.70c., Chicago.

Coke

Contracting for by-product foundry coke is practically at an end, and little resistance has been offered to the current price of \$8 a ton, local ovens. Shipments in November are only slightly above those of October.

Old Material

This market is quiet. Incoming shipments are strongly influenced by low prices and, as a result, there is close balance between cars arriving on track and consumption. Here and there is evidence that dealers are now willing to accumulate tonnages in anticipation of higher prices. It is understood that large accumulations of cast iron borings are already being undertaken as a speculative move. The Santa Fe has sold 3000 tons of

scrap and the Milwaukee road will dispose of about 7000 tons.

Prices deliv'd Chicago district consumers:
Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel.....	\$10.00 to \$10.50
Shoveling steel	10.00 to 10.50
Frogs, switches and guards, cut apart, and misc. rails	11.25 to 11.75
Factory hyd. comp. sheets	8.50 to 9.00
Drop forge flashings.....	7.75 to 8.25
No. 1 busheling	7.50 to 8.00
Forg'd cast and r'l'd steel carwheels	13.50 to 14.00
Railroad tires, charg. box size	13.50 to 14.00
Railroad leaf springs cut apart	13.50 to 14.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	12.00 to 12.50
Coil springs	13.50 to 14.00
Electric Furnace Grades:	
Axle turnings	9.25 to 9.75
Low phos. punchings.....	11.50 to 12.00
Low phos. plates, 12 in. and under	11.50 to 12.00
Blast Furnace Grades:	
Axle turnings	5.75 to 6.25
Cast iron borings	4.00 to 4.50
Short shoveling turnings..	4.75 to 5.25
Machine shop turnings....	4.75 to 5.25
Rolling Mill Grades:	
Iron rails.....	11.00 to 11.50
Rerolling rails	12.50 to 13.00
Cupola Grades:	
Steel rails, less than 3 ft..	12.50 to 13.00
Steel rails, less than 2 ft..	13.00 to 13.50
Angle bars, steel.....	11.75 to 12.25
Cast iron carwheels	11.75 to 12.25
Malleable Grades:	
Railroad	12.25 to 12.75
Agricultural	11.25 to 11.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heavier	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:	
Iron angle and splice bars.	10.50 to 11.00
Iron arch bars, and transoms	11.00 to 11.50
Iron car axles	20.00 to 21.00
Steel car axles	13.00 to 13.50
No. 1 railroad wrought...	8.50 to 9.00
No. 2 railroad wrought...	8.75 to 9.25
No. 1 busheling	6.50 to 7.00
No. 2 busheling	4.50 to 5.00
Locomotive tires, smooth..	12.50 to 13.00
Pipes and flues	5.50 to 6.00
Cupola Grades:	
No. 1 machinery cast.....	9.50 to 10.00
No. 1 railroad cast.....	9.00 to 9.50
No. 1 agricultural cast....	8.50 to 9.00
Stove plate	7.50 to 8.00
Grate bars	7.00 to 7.50
Brake shoes	7.25 to 7.75

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Testing Society Committee to Meet in Pittsburgh

The customary spring regional meeting of committees of the American Society for Testing Materials will be held the third week in March, 1931, in Pittsburgh under the auspices of the Pittsburgh district committee. A special technical program is being arranged for March 16, similar to the symposium on materials for automobiles, held in Detroit during March, 1930. The chairman of the special committee for this meeting is T. D. Lynch, consulting metallurgical engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, with F. M. Howell, engineer of tests, Aluminum Research Laboratories, New Kensington, Pa., as secretary. Mr. Lynch is a past-president of the society. A similar group meeting was held in Pittsburgh in 1924.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes.....	3.00c.
Soft steel bars	2.90c.
Reinforc'g bars, billet steel—	
Less than 5 tons.....	2.85c.
5 tons to 30 tons.....	2.45c.
30 tons to 200 tons.....	2.00c.
200 tons and over.....	1.70c.
Rail steel reinforcement—	
Less than 5 tons.....	2.50c.
5 tons to 30 tons	2.10c.
30 tons and over	1.50c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons.....	3.35c.
Flats and squares	3.85c.
Bands $\frac{3}{4}$ in. (In Nos. 10 and 12 gages)	3.10c.
Hoops (No. 14 gage and lighter)..	3.65c.
Black sheets (No. 24).....	3.80c.
Galv. sheets (No. 24).....	4.35c.
Blue ann'l'd sheets (No. 10).....	3.35c.
Spikes ($\frac{3}{4}$ in. and larger).....	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
Per Cent Off List	
Machine bolts	60 and 10
Carriage bolts.....	60 and 10
Coach or lag screws.....	60 and 10
Hot-pressed nuts, sq., tap. or blank,	60 and 10
Hot-pressed nuts, hex., tap. or blank,	60 and 10
No. 8 black ann'l'd wire, per 100 lb.	\$3.45
Com. wire nails, base per keg.	\$2.30 to 2.55
Cement c't'd nails, base per keg	2.30 to 2.55

CLEVELAND

Increased Orders for Sheets and Strip Come from Automobile Industry

CLEVELAND, Nov. 25.—More activity among some of the motor car companies which are starting on new models resulted in an increase the past week in orders for sheets and hot-rolled strip. While this business came largely from the Detroit territory, some steel was bought by local stamping plants. Some activity also developed in automobile rim sections.

Business with a few of the mills making the heavier rolled sections is showing a fair gain this month over October, this being largely due to orders for structural material. Two projected toll bridges to connect Grand Island, Niagara River, with the mainland near Niagara Falls will require 12,000 tons of structural steel, and grade crossing elimination work in Buffalo will take 2000 tons. Toledo has placed 210 tons of sheet steel piling.

Operations of Cleveland mills are unchanged this week at 44 per cent of ingot capacity.

While there has been some talk of price advances, particularly on sheets, efforts appear to be more toward the stabilization of prices at present levels and maintaining a spread, with the present minimum prices for round lot buyers and \$2 a ton higher for less attractive business. At least two producers have announced prices for the first quarter, naming a minimum of 2.35c., Pittsburgh, for black sheets and 3.30c. for auto body sheets. One is quoting a minimum of 2.05c. on blue annealed, 1.90c. on light plates, 3c. on galvanized sheets and 3.60c. on metal furniture sheets.

Some inquiry has come out for steel bars, sheets and hot-rolled strip for the first quarter, but no contracts have been closed. Recently a Valley base was used on some sheet and hot-strip business, but this is said to have been eliminated. On auto body sheets, 3.30c., Pittsburgh, is now rather common, concessions of \$2 a ton are being made on cold-rolled strip and fender stock has again declined.

Pig Iron

Inquiry for foundry and malleable iron for the first quarter has increased from motor car manufacturers and allied foundries in Michigan and Indiana, and several good-sized lots are pending in those territories. A southern Ohio foundry is inquiring for 1000 tons of foundry iron for the first quarter, and the Westinghouse Electric & Mfg. Co. has an inquiry out for iron for its Cleveland plant for its first quarter requirements. Sales were light the past week. The moderate increase in shipments this month, previously reported, is being maintained. While the motor car industry is taking more iron than in October, shipments to some of the manufacturers of heating

equipment are falling off owing to the seasonal decline in production by that industry. Ohio jobbing foundries are doing slightly better. The market has a fairly firm tone, with prices unchanged. Foundry and malleable iron are quoted at \$16 to \$17, furnace, for Ohio and Indiana delivery, \$17.50 to \$18 for Michigan shipment, and \$17.50, Cleveland, for delivery to local foundries.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25.....	\$17.50
S'th'n fdy., sil. 1.75 to 2.25.....	17.51
Malleable	17.50
Ohio silvery, 8 per cent.....	25.00
Stand. low phos., Valley.....	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; \$3 from Jackson, Ohio; \$6.01 from Birmingham.

Sheets

Orders increased the past week, during which some fair-sized lots were placed by the automotive industry in the Michigan territory and by Ohio plants making automobile stampings. Concessions to 3.30c., Pittsburgh, on auto body sheets for fair-sized lots have become quite common. While there has been some talk of higher prices for the first quarter, one leading Ohio producer has opened its books for that delivery at 2.35c. to 2.45c. for black sheets, 3.30c. to 3.40c. for auto body sheets, the minimum being present prevailing prices, and 3.70c. for steel furniture sheets and vitreous enameling stock. The price named on furniture sheets is \$2 a ton above the present price. The same interest has reestablished current prices on electrical sheets. This producer announces that these prices are subject to withdrawal. Another producer is willing to take business for delivery extending into the first quarter at the present prices. While a few inquiries have come out for first quarter, not much interest is being shown.

Bars, Plates and Shapes

Structural shapes are moving in fair volume, orders coming mostly from fabricators who still have considerable work in their shops. New inquiry in the building field is light. The Painesville highway bridge, requiring 350 tons, will be readvertised. Steel bars and plates are dull. Bars are 1.65c., Cleveland, for local delivery and 1.60c. to 1.65c. for outside shipment. Outside mills, using the higher Cleveland base, quote 1.60c., Pittsburgh, if more advantageous to the buyer. Plates and shapes are firm at 1.60c., Pittsburgh.

Wire Products

While nails are still quoted at \$1.90 to \$2 a keg, all car-lot business seems to be going at the lower price. Wire is unchanged at 2.30c., Cleveland.

Strip Steel

Demand for hot-rolled strip became more active the past week, during which some fair-sized orders were placed by automobile and parts manufacturers. The market appears firm at 1.55c. to 1.60c., Pittsburgh, for wide strip and 1.65c. to 1.70c. for narrow. Cold-rolled strip is dull and weak, with shading of \$2 a ton to 2.25c., Cleveland. This price concession appears to be limited to car lots. Fender stock has again declined \$2 a ton to 3.40c. for round lots. The 3.50c. price still applies to small lots.

Coke

Ohio by-product foundry coke has been reestablished at \$7.75, ovens, for December shipment. One producer of premium Connellsville foundry coke has opened its books for the first half at its present price of \$4.85, ovens.

Iron Ore

With the total movement by water of 46,582,982 tons, the Lake ore shipping season closed with the dispatch of the two last cargoes Nov. 23. A detailed report will be found in another column.

Old Material

With no consumer demand and shipments held up by Cleveland and Valley district mills, prices have further weakened 25c. to 50c. a ton on heavy melting steel and 25c. a ton on borings and turnings. While the quoted prices are those asked from the mills, dealers are paying 25c. to 50c. a ton less for yard stocks. With the close of the season of navigation at hand, considerable scrap has been shipped by water from Detroit to Cleveland during the past few weeks.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.....	\$10.75 to \$11.25
No. 2 heavy melting steel.....	10.00 to 10.50
Compressed sheet steel.....	10.50 to 11.00
Light bundled sheet	
stampings	9.00 to 9.25
Drop forge flashings	10.00 to 10.50
Machine shop turnings.....	5.00 to 5.50
Short shovelling turnings.....	7.75 to 8.00
No. 1 railroad wrought.....	13.00 to 13.50
No. 2 railroad wrought.....	14.00 to 14.50
No. 1 bushelling	11.00 to 11.50
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., billet bloom	
and slab crops	17.50 to 18.00
Blast Furnace Grades:	
Cast iron borings.....	7.25 to 7.50
Mixed borings and short	
turnings	7.25 to 7.50
No. 2 bushelling	6.75 to 7.00
Cupola Grades:	
No. 1 cast	13.00 to 13.50
Railroad grate bars	10.00 to 10.50
Stove plate	10.50 to 11.00
Rails under 3 ft.....	16.00 to 16.50
Miscellaneous:	
Rails for rolling	16.25 to 16.50
Railroad malleable	13.50 to 14.00

NEW YORK

Erie Railroad Places Rail Order—Pig Iron Sales Slightly Larger

NEW YORK, Nov. 25.—Pig iron sales, at 12,000 tons, slightly exceed those of a week ago and are far above the average for the last two months. At least 3000 tons of the total bought was for delivery outside of this district. Most of the buying is by the larger foundries. Many of the smaller melters have not yet taken action on their needs and, with business prospects uncertain and inventories approaching, are slow to make commitments. In some instances, also, they are taking smaller shipments against previous orders, indicating that they wish to reduce their stock piles still further before the end of the year.

Formal inquiries are few compared with the amount of tonnage that is being placed. Melters are sounding out the market with the idea of buying if prices are attractive rather than generally advertising for figures. Competition has become more severe, especially in nearby New Jersey. This territory is a battleground for Alabama, Buffalo and eastern Pennsylvania furnaces, as well as the New England producer. The latter, by arranging for storage space at Kearny, N. J., will be able to compete for smaller orders than when it had to sell in barge lots. In some cases competition in this area has brought out prices that figure back to as low as \$16, eastern Pennsylvania furnace, and \$15, Buffalo. Delivered prices would indicate a shading of even \$15, Buffalo, but it is believed that shipments can be made from barge iron stored at harbor points that will net the seller at least \$15.

The American Radiator Co., which recently bought 50,000 tons of Alabama and Mystic iron, has purchased 2000 tons for its Detroit plant and 1500 tons of Granite City iron for its Springfield, Ill., plant.

Prices per gross ton, delivered New York district:
Buffalo No. 2 fdy., sil. 1.75 to 2.25 \$20.41 to \$20.91
*Buff. No. 2, del'd east. N. J. 18.28 to 19.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25 17.39 to 18.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75 17.89 to 18.89

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

Cast Iron Pipe

A small amount of buying for winter delivery has developed, and on such business concessions up to \$1 a ton are granted. Manchester, N. H., has closed on about 400 tons of water pipe with the Warren Foundry & Pipe Co. Salem, Mass., has opened bids on 250 tons of pipe. On a recent tonnage of pipe for export, for which American and Continental pipe makers were competing, a Japanese cast

iron pipe producer was low bidder and has been awarded the contract.

Prices per net ton deliv'd New York:
Water pipe, 6-in. and larger, \$37.90 to \$38.90; 4-in. and 5-in., \$40.90 to \$41.90; 3-in., \$47.90 to \$48.90. Class A and gas pipe, \$3 extra.

Reinforcing Bars

The steel for State highway section 3, route 4, Bergen County, N. J., amounting to 1500 tons, has been placed by George M. Brewster & Son, general contractor, with the Kalman Steel Co. With this exception, lettings and new inquiries are light, although several sizable public works jobs are still pending.

For mill shipment, distributors of concrete bars quote 1.70c. a lb., Pittsburgh, on building and paving work, and 1.80c. on subway work (rail steel offered at \$4 a ton less); for delivery from local stock, 2.35c. a lb., New York, up to 3.05c. a lb. for lots of less than 2 tons.

Finished Steel

Some of the leading producers of sheets and strip steel have announced minimum prices for the first quarter. These are: 2.35c. for black sheets, 3c. for galvanized, 1.90c. for No. 10 blue annealed plates, 2.05c. for No. 13 blue annealed sheets, 3.30c. for automobile body sheets, 1.55c. for wide hot-rolled strip and 1.65c. for narrow and 2.25c. for cold-rolled strip. The 3c. price for galvanized sheets is from \$1 to \$2 a ton higher than has been obtainable on recent orders, while the prices announced for automobile body sheets and cold-rolled strip steel are \$2 a ton below published quotations of the past few weeks. A few first quarter con-

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes.....	3.10c.
Soft steel bars, small shapes.....	3.10c.
Iron bars.....	3.24c.
Iron bars, Swed. charcoal.....	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons.....	3.40c.
Flats and squares.....	3.90c.
Cold-roll. strip, soft and quarter	
hard.....	4.95c.
Hoops.....	3.75c.
Bands.....	3.40c.
Blue ann'd sheets (No. 10).....	3.25c. to 3.40c.
Black sheets (No. 24*).....	3.65c. to 3.75c.
Galvanized sheets (No. 24*).....	4.25c.
Long terme sheets (No. 24).....	5.80c.
Standard tool steel.....	12.00c.
Wire, black annealed.....	4.50c.
Wire, galv. annealed.....	5.15c.
Tire steel, ½ x ½ in. and larger..	3.40c.
Smooth finish, 1 to 2½ x ¼ in.	
and larger.....	3.75c.
Open-hearth spring steel, bases,	
higher per 100 lb.....	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller.....	65
1 x 30 in. and smaller.....	65
Carriage bolts, cut thread:	
¾ x 6 in. and smaller.....	65
¾ x 20 in. and smaller.....	65
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.....	\$19.00
Seamless steel, 2-in.....	20.25
Charcoal iron, 2-in.....	26.25
Charcoal iron, 4-in.....	67.00

tracts have been entered at the announced prices, but most of the buyers are still uninterested in forward commitments.

Aside from this development and the placing of orders for 41,748 tons of rails by the Erie, the market is devoid of feature. The Erie tonnage was divided as follows: 21,698 tons to Carnegie Steel Co., 9650 tons to Illinois Steel Co., 7200 tons to Bethlehem Steel Co. and 3200 tons to Inland Steel Co. Deliveries are to extend from February to August, 1931. Formal award of 11,000 tons of rails for New York subways has been made by the Board of Transportation.

The New York Central is inquiring for 50 Hudson-type locomotives, and will soon be in the market for about 5000 freight cars.

Coke

By-product coke ovens have virtually completed closing first half contracts for foundry coke. Specifications for foundry coke have become more irregular and in some cases have declined. Furnace coke prices range from \$2.50 to \$2.60 a net ton, Connellsville, and foundry coke quotations follow:

Special brands of beehive foundry coke, \$4.70 to \$4.85 a net ton, ovens, or \$3.41 to \$3.56 delivered to northern New Jersey, Jersey City and Newark, and \$9.29 to \$9.44 to New York and Brooklyn; by-product foundry coke, \$9 to \$9.40, Newark or Jersey City; \$10.06, New York or Brooklyn.

Old Material

The trend of prices is still downward, and brokers are unable to offer more than \$3.50, New York, or \$7 a ton, delivered Phoenixville, Pa., for machine shop turnings. No. 1 heavy melting steel is still being bought at \$7.50 a ton, New York, or \$11, delivered eastern Pennsylvania, the most important shipments moving to a Coatesville, Pa., mill.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel.....	\$7.50
Heavy melting steel (yard).....	\$5.25 to 5.50
No. 1 hvy. breakable cast..	6.75 to 7.00
Stove plate (steel works)...	5.00
Locomotive grate bars.....	5.00
Machine shop turnings....	3.50
Short shoveling turnings..	3.50
Cast borings (blast fur. or steel works).....	4.00
Mixed borings and turnings.....	3.25
Steel car axles.....	16.00
Iron car axles.....	19.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	7.25
Forge fire.....	7.00
No. 1 railroad wrought...	8.75
No. 1 yard wrought, long..	7.75
Rails for rolling.....	9.25 to 9.75
Stove plate (foundry).....	5.50
Malleable cast (railroad)...	9.50 to 10.00
Cast borings (chemical)...	8.50 to 9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast.....	\$13.00
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size.....	11.00
No. 2 cast (radiators, cast boilers, etc.).....	10.50

PHILADELPHIA

Pig Iron Prices Lack Strength— Steel Buying Still Small

PHILADELPHIA, Nov. 25.—Orders being placed with eastern Pennsylvania steel mills are still small and the aggregate tonnage shows no appreciable increase, but a steadier flow of business is noted and prices are fairly well maintained. Only on the more desirable plate and shape tonnages are concessions of \$1 a ton granted. While certain consumers have protections on plates and shapes at lower than 1.70c., Coatesville, Pa., for plates and 1.70c., Eastern mill, for shapes, these will expire in December, and sellers show no inclination to renew at less than current quotations. One eastern Pennsylvania mill has withdrawn all outstanding shape quotations at less than 1.70c., f.o.b. mill, and is endeavoring to establish this as a minimum.

Local construction work is bringing some large tonnages of structural steel and plates into the market. A 30-story bank building in Philadelphia will require 8000 tons of fabricated steel, and 5000 tons is still to be placed for subway construction. A large gas holder at Conshohocken, Pa., for the Philadelphia Electric Co., requiring about 3000 tons of plates, has been awarded to the Cruse-Kemper Co., Ambler, Pa., for fabrication, and the steel is expected to go to mills in the immediate vicinity.

The Baltimore & Ohio has allocated 75,000 tons of rails, Carnegie Steel Co. receiving 46,000 tons, Bethlehem Steel Co. 19,000 tons, Illinois Steel Co. 5500 tons, and the Inland Steel Co. 4500 tons.

Steel Bars

Buying is small. The quotation is unchanged at 1.60c. a lb., Pittsburgh, or 1.89c., delivered Philadelphia. An eastern Pennsylvania plate mill is preparing to roll large-size flat bars up to 6 in. minimum width. Reinforcing bar projects are mostly small. About 200 tons is required for a high school in Baltimore. Reinforcing bar quotations on recent projects have been unchanged at 1.70c. to 1.75c. a lb., Pittsburgh, or 1.99c. to 2.04c., delivered Philadelphia, for billet steel, with rail steel bars at about 1.55c., Franklin, Pa., or 1.84c., delivered Philadelphia.

Pig Iron

Foundry iron consumers show little inclination to contract for delivery next year. In certain instances small orders have been offered to sellers for December shipment, with a proviso that billing shall be after Jan. 1, so that the purchase will not appear on this year's books. Competition of Southern foundry iron continues, and eastern Pennsylvania furnaces have shown more willingness recently to meet the delivered prices quoted by

Birmingham makers. While \$17.50 to \$18 a ton, furnace, is generally quoted by eastern Pennsylvania sellers on small orders for foundry iron, desirable tonnages have brought slight concessions, especially when Southern iron was being considered by the buyer. Consumers of basic pig iron in eastern Pennsylvania are well covered for the rest of this year and further contracts are not expected until January.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	\$18.26 to \$19.26
East. Pa. No. 2X, 2.25 to 2.75 sil.	18.76 to 19.76
East. Pa. No. 1X.	19.26 to 20.26
Basic (del'd east. Pa.)	17.75 to 18.25
Malleable	21.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to 24.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

Shapes

Mill operations continue at not more than 40 to 45 per cent of capacity. The general quotation on new business is 1.70c., f.o.b. nearest mill to consumer, or 1.76c., delivered Philadelphia. On desirable tonnages, about \$1 a ton concession is granted by certain sellers, although one producer in eastern Pennsylvania has withdrawn all outstanding quotations at lower prices and others expect to take similar action.

Plates

New business is small, but eastern Pennsylvania mills are maintaining 1.70c. a lb., Coatesville, Pa., or 1.80½c., delivered Philadelphia, on most of the current orders. Occasional concessions of \$1 a ton are granted on the more important contracts. While certain large consumers are protected at lower prices than 1.70c., Coatesville, the protections expire in December, and mills are not

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform.	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ¼-in. inclu.	2.90c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.60c.
†Galvanized sheets (No. 24)	4.15c.
Light plates, blue annealed (No. 10)	3.05c.
Blue ann'd sheets (No. 13)	3.20c.
Diam. pat. floor plates, ¼-in.	5.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 40 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

inclined to renew at less than the current price.

Sheets

Local radio manufacturers are beginning to curtail output as their season of greatest activity nears an end. Other consumers of sheets in this district are buying only small lots for immediate needs, evidently wishing to keep their inventory at a minimum until the books on this year's business are closed. Black sheets are quoted at 2.35c., Pittsburgh, or 2.64c., delivered Philadelphia. Galvanized sheets are being quoted at 3c., Pittsburgh, or 3.29c., Philadelphia, but \$2 a ton concessions to 2.90c., Pittsburgh, or 3.19c., Philadelphia, are still obtainable by distributors. Blue annealed sheets are 2.05c., Pittsburgh, or 2.34c., Philadelphia, for No. 13 gage, and blue annealed plates 1.90c., Pittsburgh, or 2.19c., Philadelphia, for No. 10 gage.

Imports

In the week ended Nov. 22, arrivals at this port consisted of 3948 tons of manganese ore from Brazil, and a total of 4357 tons of pig iron, of which 3357 tons was from British India and 1000 tons from the United Kingdom.

Old Material

All grades of scrap continue to lack strength. No. 1 heavy melting steel has been bought by a consumer at Bethlehem, Pa., at \$11.10 a ton, from railroad lists, and the same mill has been able to buy 1500 tons of unprepared scrap of dismantled submarines at \$5.43, Philadelphia, or \$7, delivered. A consumer of machine shop turnings at Phoenixville, Pa., has reduced the buying price a further 50c. a ton to \$6.50, delivered from local stocks, and \$7.50, delivered from New England.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	\$12.00
No. 2 heavy melting steel	10.00
Heavy melting steel (yard)	9.50
No. 1 railroad wrought	\$13.00 to 14.00
Bundled sheets (for steel works)	9.00
Hydraulic compressed, new	10.00 to 11.00
Hydraulic compressed, old	9.00 to 9.50
Machine shop turnings (for steel works)	6.50 to 7.50
Heavy axle turnings (or equiv.)	10.50 to 11.00
Cast borings (for steel works and roll. mill)	8.00 to 8.50
Heavy breakable cast (for steel works)	11.00 to 11.50
Railroad grate bars	9.00
Stove plate (for steel works)	9.00
No. 1 low phos., hvy., 0.04% and under	19.00 to 20.00
Couplers and knuckles	16.50 to 17.50
Rolled steel wheels	15.50 to 16.00
No. 1 blast f'nace scrap	7.00 to 7.50
Wrot. iron and soft steel pipes and tubes (new specific)	11.50 to 12.00
Shafting	18.00
Steel axles	20.50 to 21.00
No. 1 forge fire	11.00
Cast iron carwheels	14.00 to 14.50
No. 1 cast	12.00 to 12.50
Cast borings (for chem. plant)	14.00 to 14.50
Steel rails for rolling	13.50 to 14.00

BOSTON

Pig Iron Sales Increase, but Scrap Market Remains Inactive

BOSTON, Nov. 25.—Pig iron sales jumped to more than 5000 tons the past week, with furnaces east of Buffalo far in the lead in bookings. A small part of the iron is for New Jersey consumption, and all of it for 1931 delivery. Approximately 3000 tons additional is expected to be closed this week, including 1000 tons of No. 2X for a Vermont scale manufacturer and 700 tons for a Massachusetts machinery maker. The current buying movement is presumably based on the belief that prices have hit bottom.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25..	\$19.78 to \$20.28
†Buffalo, sil. 2.25 to 2.75..	19.78 to 20.28
*Buffalo, sil. 1.75 to 2.25..	20.41 to 20.91
*Buffalo, sil. 2.25 to 2.75..	20.91 to 21.41
Va., sil. 1.75 to 2.25..	25.21
Va., sil. 2.25 to 2.75..	25.71
*Ala., sil. 1.75 to 2.25..	21.11
*Ala., sil. 2.25 to 2.75..	21.61
†Ala., sil. 1.75 to 2.25..	17.25
†Ala., sil. 2.25 to 2.75..	17.75

Freight rates: \$4.91 all rail and \$4.28 rail and water from Buffalo; \$5.21 all rail from Virginia; \$9.61 all rail from Alabama and \$5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Reinforcing Steel

Three lots aggregating 800 tons and numerous small orders, the largest of which was 50 tons for the Boston Floating Hospital, brought sales for the week up to more than 1000 tons. It is reported that 225 tons for a State bridge, 165 tons for a Boston bathhouse, and 200 tons for a Massachusetts county institution will be closed this week. Billet steel bars from stock are: 1 to 5-ton lots, 3c. a lb., base; 6 to 99-ton lots, 2.50c. to 2.55c.; 100-ton lots and larger, 2.15c. to 2.25c. Rail steel bars are 2.26½c. a lb., delivered Boston freight rate points.

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.36½c.
Structural shapes—	
Angles and beams.....	3.36½c.
Tees	3.36½c.
Zees	3.36½c.
Soft steel bars, small shapes.....	3.26½c.
Reinforcing bars.....	3.11½c. to 3.26½c.
Iron bars—	
Refined	3.26½c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats.....	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tire steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.....	3.50c. to 5.50c.
Squares and flats.....	4.00c. to 6.00c.
Toe calk steel	6.00c.
Rivets, structural or boiler.....	4.80c.
Per Cent Off List	
Machine bolts	60 and 5
Carriage bolts	60 and 5
Lag screws	60 and 5
Hot-pressed nuts	60 and 5
Cold-punched nuts	60 and 5
Stove bolts	70 and 10

Cast Iron Pipe

Manchester, N. H., has placed 700 tons of 6 to 20-in. pipe with the Warren Foundry & Pipe Co. Business otherwise has been in car lots, with foundries generally quoting \$36 a ton, foundry, for 6-in. and larger dimensions. Boston will close bids Dec. 4 on 200 tons of 6-in. pipe, 500 tons of 8-in., 200 tons of 10-in., 1000 tons of 12-in., 250 tons of 16-in., a total of 2150 tons, and 30 tons of special castings, 24 to 48-in. stock. Norwood, Mass., is in the market for 175 tons of 6 and 8-in. pipe; Bridgewater, Mass., closes bids today on 500 tons of 6 and 8-in., and Salem, Mass., on 375 tons of 16-in.

Old Material

Scrap brokers have almost no business on their books. Some owners of material will not sell at current offers, and prices continue to sag to new low levels. No. 1 heavy melting steel was sold the past week at as high as \$7.10 a ton, on cars ship-

ping point, but most transactions were at \$6.60 to \$6.80 a ton. A limited tonnage of breakable cast has been moved at \$5.60 to \$6.10 a ton, and a little No. 1 machinery cast at \$11.50 to \$12. The American Steel & Wire Co., Worcester, Mass., has stopped buying heavy melting steel and skeleton, while a Portland, Me., rolling mill has withdrawn from the steel axle market. There is virtually nothing doing in other kinds of scrap.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel.....	\$6.50 to \$7.00
Scrap T rails.....	6.50 to 7.00
Scrap girder rails.....	5.50 to 6.00
No. 1 railroad wrought....	7.50 to 7.60
Machine shop turnings.....	2.50 to 3.10
Cast iron borings (steel works and rolling mill).....	2.50 to 3.10
Bundled skeleton, long....	6.00 to 6.50
Forge flashings	6.00 to 6.50
Blast furnace borings and turnings	2.50 to 2.75
Forge scrap	5.75 to 6.00
Shafting	12.50 to 13.50
Steel car axles.....	15.00 to 16.00
Wrought pipe, 1 in. in diameter (over 2 ft. long).....	6.00 to 6.50
Rolls for rolling	10.00 to 10.25
Cast iron borings, chemical.....	9.00 to 9.50

Prices per gross ton deliv'd consumers' yards:

Textile cast	\$11.00 to \$11.50
No. 1 machinery cast.....	11.50 to 12.50
No. 2 machinery cast.....	10.00 to 10.50
Stove plate	8.00 to 8.50
Railroad malleable.....	13.00 to 13.50

ST. LOUIS

Pig Iron and Steel Buying Very Light—Scrap Shows Further Weakness

ST. LOUIS, Nov. 25.—Buying of pig iron by melters in this district continues exceedingly light, commitments for the week totaling only about 1200 tons, including 350 tons of basic for an East Side foundry and 200 tons and 175 tons to an Indiana and Iowa melter respectively. Prices are steady, makers being disinclined to make concessions to get business. No inquiries for first quarter shipment have been made, so far as is known. The stove foundry trade for the first half of November showed a considerable improvement over the preceding month, although it was below the figures for the same period last year.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill....	\$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., deliv'd St. Louis	19.66
Southern No. 2 fdy., deliv'd.....	\$15.42 to 15.92
Northern malleable, deliv'd.....	19.16 to 19.66
Northern basic, deliv'd.....	19.16 to 19.66

Freight rates: 75c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

Finished Steel

Rollers of reinforcing bars in this district are expected to share in the distribution of 3325 tons of this material for the Merchandise Mart. Bids on the general contract were opened yesterday. This is the largest building project to be definitely decided upon for some time. The demand for structural steel is so low that the fabricators are said to be operating at less than 40 per cent of capacity,

with no projects requiring sizable tonnages in sight. Most of the present operations are on ornamental steel. Warehouse trade for the month so far is about at a level with the same period last month. Buying of plates, shapes and bars is light.

Old Material

Further weakness marks the scrap market. There has been no new buying by the mills, and dealers are about covered on orders recently placed with them. Dealers do not expect that there will be any buying of consequence during the remainder of the

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
Cold-fin. rounds, shafting, screw stock	3.60c.
Black sheets (No. 24).....	4.25c.
Galv. sheets (No. 24).....	4.60c.
Blue ann'd sheets (No. 10).....	3.45c.
Black corrug. sheets (No. 24).....	4.10c.
Galv. corrug. sheets.....	4.70c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
Per Cent Off List	
Tank rivets, ½-in. and smaller, 100 lb. or more	65
Less than 100 lb.....	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50

year, and there are fears that there will be considerable distress scrap. Selected heavy melting steel is off 75c. a ton, and No. 1 and No. 2 are each 25c. lower, as are railroad springs and No. 2 railroad wrought. Steel car axles, wrought iron bars and transoms and steel angle bars are 50c. lower.

Railroad lists: Terminal Railway (St. Louis), 2605 tons; Chicago & Alton, 1590 tons; Missouri-Kansas-Texas, 460 tons; New York, Chicago & St. Louis, 52 carloads, and Chicago & Eastern Illinois, 14 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	\$10.25 to \$10.75
No. 1 heavy melting or shoveling steel	9.75 to 10.25
No. 2 heavy melting or shoveling steel	9.00 to 9.50
No. 1 locomotive tires	11.00 to 11.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	10.00 to 10.50
Railroad springs	12.50 to 13.00
Bundled sheets	6.50 to 7.00
No. 2 railroad wrought	9.75 to 10.25
No. 1 busheling	7.00 to 7.50
Cast iron borings and shoveling turnings	6.00 to 6.50
Iron rails	10.00 to 11.00
Rails for rolling	11.50 to 12.00
Machine shop turnings	3.50 to 4.00
Heavy turnings	8.00 to 8.50
Steel car axles	14.00 to 15.00
Iron car axles	20.50 to 21.00
Wrot. iron bars and trans.	12.50 to 13.00
No. 1 railroad wrought	7.50 to 8.00
Steel rails, less than 3 ft.	13.00 to 13.50
Steel angle bars	10.00 to 10.50
Cast iron carwheels	11.00 to 11.50
No. 1 machinery cast	10.50 to 11.00
Railroad malleable	10.25 to 10.75
No. 1 railroad cast	10.00 to 10.50
Stove plate	8.50 to 9.00
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	10.00 to 10.50

Coke Output Slightly Higher in October

WASHINGTON, Nov. 25.—Total output of by-product coke during the 31 days of October was 3,431,529 net tons, a small gain over September, according to the Bureau of Mines, although the October average daily rate of 110,694 tons showed a decline of 2.7 per cent from the preceding month.

Estimated production of beehive coke was 177,800 tons, a gain of 5.8 per cent over September. The average daily rate of beehive output increased 1.9 per cent over September.

A new battery of 31 Koppers ovens was put into operation in October by the Colorado Fuel & Iron Co., at Pueblo, Colo.

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.15c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex.	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.60c.
Bands	3.50c.
Hoops	3.90c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	\$2.60
Black wire, base per 100 lb.	3.20

BUFFALO

BUFFALO, Nov. 25.—About 3500 tons of pig iron was sold in this district in the past week. All of this business was in small lots for prompt delivery, with the exception of one lot of 500 tons of foundry. The only sizable inquiry is for 1500 tons of foundry for a New Jersey melter.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	\$17.50
No. 2X fdy., sil. 2.25 to 2.75	18.00
No. 1 fdy., sil. 2.75 to 3.25	19.00
Malleable, sil. up to 2.25	18.00
Basic	17.50
Lake Superior charcoal	27.28

Finished Steel

Operations of Buffalo mills remain about the same. The Lackawanna plant of the Bethlehem Steel Co. is operating 11 open-hearths of 24. About half of the mills are down and the remainder on single turn. A slightly better operation is evident at the Donner plant of the Republic Steel Corp., where five open-hearths, including one of the larger furnaces, are operating. Wickwire-Spencer Steel Co. continues to operate two open-hearths; Gould Coupler, one.

Bridges to be built across the Niagara River to Grand Island will require about 12,000 tons of structural steel, it is estimated. Bids will not be received on this until early next year.

Bridges Over Niagara River Will Take 12,000 Tons of Steel

Old Material

Operations in the local market are very slow. Prices are unchanged, but show no signs of strengthening.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	\$11.50
No. 2 heavy melting scrap	10.00
Scrap rails	\$12.00 to 12.50
Hydraul. comp. sheets	10.00
Hand bundled sheets	8.00 to 8.50
Drop forge flashings	10.00
No. 1 busheling	10.00
Hvy. steel axle turnings	11.00 to 11.50
Machine shop turnings	6.00 to 6.50
No. 1 railroad wrought	10.00 to 10.50
Acid Open-Hearth Grades:	
Knuckles and couplers	14.00 to 14.50
Coil and leaf springs	14.00 to 14.50
Rolled steel wheels	14.00 to 14.50
Low phos. billet and bloom ends	15.00 to 15.50
Electric Furnace Grades:	
Short shov. steel turnings	8.50 to 9.00
Blast Furnace Grades:	
Short mixed borings and turnings	7.00 to 7.50
Cast iron borings	7.00 to 7.50
No. 2 busheling	6.00
Rolling Mill Grades:	
Steel car axles	15.00 to 15.50
Iron axles	19.00 to 19.50
Cupola Grades:	
No. 1 machinery cast	10.25 to 11.00
Stove plate	9.50 to 10.00
Locomotive grate bars	8.25 to 9.25
Steel rails, 3 ft. and under	15.00 to 15.50
Cast iron carwheels	13.50 to 14.00
Malleable Grades:	
Industrial	14.00 to 14.50
Railroad	14.00 to 14.50
Agricultural	14.00 to 14.50
Special Grades:	
Chemical borings	11.50 to 12.00

PACIFIC COAST

SAN FRANCISCO, Nov. 22 (By Air Mail)—Some increase in demand for both structural steel shapes and reinforcing bars is noted, and pending business calls for a fair-sized tonnage. Prices are holding fairly well to levels established a few weeks ago. Increased activity in the building construction field is expected.

Bars

Awards of reinforcing bars totaled 1950 tons. The Truscon Steel Co. secured 400 tons for the State Building, Los Angeles. A warehouse on Ninth Street, Los Angeles, was placed with the Pacific Coast Steel Corp. and will require 350 tons. In addition, numerous small lots, ranging from 30 to 70 tons, were booked. Los Angeles and San Francisco out-of-stock prices continue unchanged at 2.50c., base, on carload lots. Movement of merchant bar steel continues to be confined to unimportant lots. On this class of material 2.10c. to 2.20c., c.i.f., appears to be general.

Plates

The Steel Tank & Pipe Co. will fabricate 390 tons for a 24-in. welded steel pipe line for the East Bay Mu-

Demands Increase for Structural Shapes and Reinforcing Bars

Pig iron prices per gross ton at San Francisco:

*Utah basic	\$22.00 to \$24.00
*Utah fdy., sil. 2.75 to 3.25	22.00 to 24.00
**Indian fdy., sil. 2.75 to 3.25	22.00 to 24.00

*Delivered San Francisco.

**Duty paid, f.o.b. cars San Francisco.

nicipal Utility District, Oakland. The Willamette Iron & Steel Co. secured 300 tons for six digester and two accumulator tanks for the Weyerhaeuser Timber Co., Long View, Wash. The Birchfield Boiler Co. is low bidder on a 30-in. welded steel pipe line for Tacoma, calling for 600 tons. Santa Cruz, Cal., rejected bids on 350 tons of 20-in. welded pipe. Bids will be opened Dec. 12 on 243 tons for two

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.40c.
Black sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.00c.
Struc. rivets, 1/2-in. and larger	5.00c.
Com. wire nails, base per keg	\$3.35
Cement c'd nails, 100 lb. keg	3.35

tanks for the United States Bureau of Public Roads, Denver. Prices are weak at 2.05c., c.i.f.

Shapes

Among the larger lettings were 550 tons for a bakery in Los Angeles and 400 tons for a municipal light plant in Pasadena, booked by the McClintic-Marshall Co. The Golden Gate Iron Works took 130 tons for an apartment house on Fair Oaks Avenue, San Francisco. Bids have been opened on 4000 tons for the new Ford plant at Seattle. Bids will be opened Nov. 24 on 1300 tons for an auditorium in Pasadena. Interest this week was centered in the opening of bids on 7500 tons for the Olympic Club, San Francisco. The Pacific Coast Steel Corp. was low at \$566,625, or \$75.55 a ton fabricated and erected. Shapes range from 2.15c. to 2.25c., c.i.f.

Cast Iron Pipe

The United States Pipe & Foundry Co. took 126 tons of 20-in. Class F pipe for Anacortes, Wash. Los Angeles will open bids Nov. 24 on 3336 tons of 8- and 12-in. Class 150 pipe. San Francisco will open bids Dec. 1 on 926 tons of 6- and 8-in. Class 150 pipe. No action has yet been taken on 260 tons and 134 tons respectively for Hoquiam and Renton, Wash.

October Automobile Sales Lowest Since December

WASHINGTON, Nov. 25.—Factory sales of motor vehicles in the United States in October totaled 150,044 units, the lowest since last December, with a total of 120,007, and a decline of 66,833 from September of the current year, according to the Department of Commerce. Sales in October consisted of 112,209 passenger cars, 37,244 trucks and 591 taxicabs, comparing with 175,311 passenger cars, 41,157 trucks and 409 taxicabs in September.

In the 10 months ended with October, motor vehicle sales totaled 3,071,869, against 5,020,840 in the corresponding period of last year. The 1930 sales consisted of 2,592,022 passenger cars, 473,834 trucks and 6013 taxicabs, against 4,310,954 passenger cars, 695,426 trucks and 14,460 taxicabs in the first 10 months of last year.

Motor vehicle sales in Canada in October totaled 4541 units, consisting of 3206 passenger cars and 1335 trucks. September sales amounted to 7957 units, made up of 5623 passenger cars and 2334 trucks.

In the first 10 months of 1930 Canadian sales totaled 143,163 vehicles, against 248,376 in the corresponding period of last year. The 1930 sales consisted of 117,690 passenger cars and 25,473 trucks, against 195,935 passenger cars and 52,411 trucks sold in the first 10 months of 1930.

Midvale Co., Philadelphia, has removed its Washington office to the Hill Building, 839 Seventeenth Street, N. W.

BIRMINGHAM

Blast Furnace to Be Blown Out— No Improvement Seen

BIRMINGHAM, Nov. 25.—Pig iron producers report that the past week was the quietest of the month in both shipments and new business. Shipments to district consumers this month are estimated to be slightly less than for October. One merchant producer has plans for blowing out a furnace within the next few days. There have been a few inquiries for first quarter, but furnace interests have stated that no price has been named for that period, and sales are being limited to December delivery at \$14, base Birmingham. Active furnaces at present total 10, the same as for the past two weeks. Nine furnaces are on foundry iron and one on basic iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:
No. 2 fdy., 1.75 to 2.25 sil. \$14.00
No. 1 fdy., 2.25 to 2.75 sil. 14.50
Basic 14.00

Finished Steel

Specifications were a little better last week, but new business did not gain. Stocks of both mills and consumers are at the low point of the year. Quotations on blue annealed and boxed annealed sheets have been reduced \$1 a ton. Galvanized sheets are now quoted at 3.15c., which is \$1 more than the former minimum quotation.

Structural steel tonnage is still held in abeyance. Several thousand tons for work in Tennessee and Louisiana will be up for award within three weeks. The Ingalls Iron Works Co. has booked 325 tons for the Charlotte Pipe & Foundry Co., Charlotte, N. C.

Of the 23 open-hearths in the district, nine are active, showing no change for the past few weeks.

Cast Iron Pipe

Backlogs have declined during the slow market of the past 10 days. Pressure pipe makers hope to secure enough tonnage from projects on which bids are to be opened about Dec. 1 to sustain present operating schedules during most of December. Lawton, Okla., is expected to place contracts by early December for 12,000 ft. of 24-in. pipe. The letting at New Orleans, scheduled for Dec. 3, will require several hundred tons of 24, 30 and 48-in. pipe. Los Angeles is reported to be in the market for a good tonnage. Spartanburg, S. C., will open bids Dec. 16 on 8450 ft. of 6 and 8-in. pipe. Clinton, La., opens bids today on a small tonnage. The American Cast Iron Pipe Co. has booked a project at Marrero, La., requiring about 800 tons. Plants have stocked more pipe this month than during October. Prices hold at the same quotations of \$37 to \$38 a ton, Birmingham, for 6-in. and larger sizes.

Old Material

Dealers report no indications of improvement before Jan. 1, when buying is expected to take a decided upward turn for the first time in months. Quotations are unchanged.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:
Heavy melting steel.....\$10.00 to \$10.50
Scrap steel rails..... 11.00 to 11.50
Short shoveling turnings.. 9.00
Cast iron borings..... 9.00
Stove plate 9.00
Steel axles 19.00
Iron axles 18.00
No. 1 railroad wrought... 10.00
Rails for rolling..... 11.50 to 12.00
No. 1 cast..... 11.00 to 11.25
Tramcar wheels 11.00 to 11.25
Cast iron borings, chem.... 13.50
Cast iron carwheels..... 11.00

CANADA

Melters of Pig Iron and Scrap Buying Meagerly

TORONTO, Nov. 25.—The demand for foundry and malleable iron is showing indications of improvement. However, melters are confining orders to spot needs. Prices are unchanged.

Prices per gross ton:
Delivered Toronto
No. 1 fdy., sil. 2.25 to 2.75.....\$22.60
No. 2 fdy., sil. 1.75 to 2.25..... 22.10
Malleable 22.60
Delivered Montreal
No. 1 fdy., sil. 2.25 to 2.75.....\$24.00
No. 2 fdy., sil. 1.75 to 2.25..... 23.50
Malleable 24.00
Basic 22.50

Old Material

Buying of iron and steel scrap failed to improve during the week. Consumers are out of the market except at such times as supplies are needed for immediate consumption. There is some movement of heavy melting steel. Turnings are without

a market and dealers decline to take in supplies. Dealers' buying prices are unchanged.

Dealers' buying prices for old material:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel.....	\$7.00	\$6.00
Rails, scrap	7.00	6.00
No. 1 wrought.....	6.00	8.00
Machine shop turnings...	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings.....	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron....	7.00	11.00
No. 1 machinery cast....	10.00	10.00
Stove plate	8.00	8.00
Standard carwheels.....	8.50	8.50
Malleable	8.00	8.00
	Per Net Ton	
No. 1 mach'ry cast.....	11.00
Stove plate	9.00
Standard carwheels	10.00
Malleable scrap	9.00

CINCINNATI Pig Iron Buying a Little More Active —Sheet Steel Demand Improves

CINCINNATI, Nov. 25.—There has been a noticeable improvement in pig iron business in the past week. The tonnage was considerably larger than in the previous week. While most of the orders called for lots ranging from a carload to 100 tons for early shipment, a central Indiana consumer bought 2400 tons of foundry iron for December and first quarter shipment. The only important inquiry is from a south central Ohio buyer, who wants 1000 tons of Northern foundry iron. Foundries in this district are still operating on short time and most of them are interested only in nearby requirements.

Prices per gross ton, deliv'd Cincinnati:
So. Ohio fdy., sil. 1.75 to 2.25 \$20.89 to \$21.39
Ala. fdy., sil. 1.75 to 2.25.. 14.69 to 15.19
Ala. fdy., sil. 2.25 to 2.75.. 15.19 to 15.69
Tenn. fdy., sil. 1.75 to 2.25. 14.69 to 15.19
S'th'n Ohio silvery, 8 per cent 24.39

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

Finished Steel

Manufacturers of sheet steel in this district report that sales, especially to some of the automobile companies, have improved during the past week. A leading producer believes that the low point for the sheet steel industry has been passed and that gradual betterment may be expected. Schedules of sheet mills are around 50 per cent of capacity.

Old Material

With mills reluctant to accept shipments on contracts and new business infrequent, the scrap market is quiet and featureless. Dealers have re-

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
New billet reinfoc. bars.....	3.15c.
Rail steel reinfoc. bars.....	3.00c.
Hoops	3.90c.
Bands	3.35c.
Cold-fin. rounds and hex.....	3.80c.
Squares	4.30c.
Black sheets (No. 24).....	4.05c.
Galvanized sheets (No. 24).....	4.90c.
Blue ann'd sheets (No. 10).....	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'd wire, per 100 lb.....	\$3.00
Com. wire nails, base per keg (25 kegs or more).....	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.....	10.25
Net per 100 Ft.	
Lap-welded steel boiler tubes, 2-in..	\$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in....	17.50
4-in.	36.00

duced their offering prices 50c. a ton on borings, No. 2 busheling and locomotive tires.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel.....	\$10.00 to \$10.50
Scrap rails for melting....	11.00 to 11.50
Loose sheet clippings.....	6.00 to 6.50
Bundled sheets	9.25 to 9.75
Cast iron borings	4.50 to 5.00
Machine shop turnings....	5.50 to 6.00
No. 1 busheling.....	8.50 to 9.00
No. 2 busheling.....	5.00 to 5.50
Rails for rolling.....	12.00 to 12.50
No. 1 locomotive tires....	12.00 to 12.50
No. 2 railroad wrought....	10.00 to 10.50
Short rails	15.25 to 15.75
Cast iron carwheels.....	11.00 to 11.50
No. 1 machinery cast....	14.50 to 15.00
No. 1 railroad cast.....	12.50 to 13.00
Burnt cast	7.00 to 7.50
Stove plate	7.00 to 7.50
Brake shoes	7.00 to 7.50
Agricultural malleable....	12.50 to 13.00
Railroad malleable	13.50 to 14.00

serve 1929 wage scales and that is why they are now making a determined effort to stabilize prices against further concessions.

"Because of the great reduction in automobile production and sales in 1930 the new year will begin with a deferred consumer demand for cars. I expect to see an increase in the output of automobiles of at least 1,000,000 cars in 1931 over 1930, with consequent better demand for steel from this source."

Referring to the Republic Steel Corp., Mr. Fairless said that since the formation of the merger last April marked progress had been made in building up a well-knit organization in all departments.

"Important economies have been effected and plants are rapidly being brought to a high standard of operating efficiency," he said. "Such results as these are the aim of every well-planned industrial merger. That these ends have been accomplished by Republic will become apparent with the return of more normal business condi-

tions. During the current year the corporation has indicated its faith in the business future by the outlay of \$10,000,000 in plant improvements."

Honor President Farrell

On the occasion of the 16th anniversary of India House in New York, Nov. 19, the members and board of governors tendered a testimonial dinner to James A. Farrell (president, United States Steel Corp.), who has been president of India House since its founding. About 160 members gathered in the Marine room for dinner. E. A. S. Clarke presided, and tributes were paid to Mr. Farrell, for his lifelong devotion to foreign trade, by Frederick Strauss, Newcomb Carlton, P. A. S. Franklin and Joseph P. Grace.

Mr. Farrell was presented with a handsome silver dish originally presented to Rear Admiral Hood of the British Navy in 1802 by officers of the British Army who cooperated with Rear Admiral Hood in his various Caribbean operations. Mr. Farrell paid gracious acknowledgment to the members and presented India House with two very interesting volumes. The first was an original copy of the first directory of New York, which showed that Alexander Hamilton and Aaron Burr lived in close proximity to where India House now stands. The second was a rare volume which proved to be a charter of the famous East India Co., wherein there are certain notations made by Charles Lamb during the time he was employed by that company.

Fewer Stokers Sold

Sales of mechanical stokers in October totaled 92 units with 38,276 rated hp., against 128 with 42,899 hp. in September, and 178 with 56,108 hp. in October of last year, according to reports received by the Bureau of Census from the 11 leading producers.

Detroit Scrap Prices at Bottom, Dealers Believe

DETROIT, Nov. 25.—Although there has been a slight recession in a few items, local dealers believe that scrap prices are at bottom. Buying by consumers is inconsequential. December scrap lists of automobile companies, with the exception of Chevrolet and Hudson, reflect curtailed manufacturing operations.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	\$9.75 to \$10.25
Borings and short turnings ..	4.50 to 5.00
Long turnings	3.75 to 4.25
No. 1 machinery cast.....	10.00 to 10.50
Automotive cast	11.75 to 12.25
Hydraul. comp. sheets....	9.50 to 10.00
Stove plate	7.25 to 7.75
New No. 1 busheling.....	8.25 to 8.75
Old No. 2 busheling.....	3.50 to 4.00
Sheet clippings	6.50 to 7.00
Flashings	8.25 to 8.75

B. F. Fairless Sees Early Improvement in Steel

Firmer prices for steel and the beginning of recovery of operations in the industry early in 1931 were forecast by B. F. Fairless, first vice-president of the Republic Steel Corp., in an address before Warren, Ohio, business men. There are many signs that the start of a buying movement in steel is not far distant, he declared.

"The production of steel in November has dropped to an annual rate about 35 per cent under the average production of the last five years," said Mr. Fairless. "The country's use of steel has not declined so heavily and correction of this wholly abnormal situation is not likely to be much longer delayed."

"Steel prices have fallen more sharply than other industrial prices. Steel bars, plates and shapes at \$1.60 per 100 lb., are 20 per cent below the 1926 average, compared with a decline of all wholesale prices of 16 per cent. Leading steel producers expect to pre-

▲▲ Semi-Finished Steel, Raw Materials, Bolts and Rivets ▲▲

Mill Prices of Semi-Finished Steel

Billets and Blooms	
	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	\$31.00
Rerolling, 4-in. and under 10-in., Youngstown	31.00
Rerolling, 4-in. and under 10-in., Cleveland	31.00
Rerolling, 4-in. and under 10-in., Chicago	32.00
Forging quality, Pittsburgh	36.00

Sheet Bars	
(Open Hearth or Bessemer)	
	Per Gross Ton
Pittsburgh	\$31.00
Youngstown	31.00
Cleveland	31.00

Slabs	
(8 in. x 2 in. and under 10 in. x 10 in.)	
	Per Gross Ton
Pittsburgh	\$31.00
Youngstown	31.00
Cleveland	31.00

Skelp	
(F.o.b. Pittsburgh or Youngstown)	
	Per Lb.
Grooved	1.60c. to 1.70c.
Universal	1.60c. to 1.70c.
Sheared	1.60c. to 1.70c.

Wire Rods	
(Common soft, base)	
	Per Gross Ton
Pittsburgh	\$36.00
Cleveland	36.00
Chicago	37.00

Prices of Raw Material

Ores	
Lake Superior Ores, Delivered Lower Lake Ports	
	Per Gross Ton
Old range Bessemer, 51.50% iron	\$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40
Foreign Ore, c.i.f. Philadelphia or Baltimore	
	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria, 8c. to 9c.	
Iron ore, low phos., Swedish, average 68% iron	11c.
Iron ore, basic Swedish, average 65% iron	9c.
Manganese ore, washed 52% manganese, from the Caucasus	26c. to 28c.
Manganese ore, Brazilian, African or Indian, basic 50%	26c. to 28c.
Langsten ore, high grade, per unit, in 60% concentrates	\$12.00 to \$13.00
	Per Gross Ton
Chrome ore, 45 to 50% Cr ₂ O ₃ crude, c.i.f. Atlantic seaboard	\$22.00 to \$24.00
	Per Lb.
Molybdenum ore, 85% concentrates of MoS ₂ delivered	50c. to 55c.

Coke	
	Per Net Ton
Furnace, f.o.b. Connellsville prompt	\$2.50 to \$2.60
Foundry, f.o.b. Connellsville prompt	3.25 to 4.75
Foundry, by-products, Ch'go ovens	8.00
Foundry, by-products, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal	
	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	\$1.25 to \$1.35
Mine run coking coal, f.o.b. W. Pa. mines	1.40 to 1.50
Gas coal, 1/4-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	.35 to .55
Gas slack, f.o.b. W. Pa. mines	.90 to 1.00

Ferromanganese	
	Per Gross Ton
Domestic, 80%, seaboard	\$94.00 to \$99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen	
	Per Gross Ton Furnace
Domestic, 19 to 21%.....	\$30.00
Domestic, 16 to 19%.....	28.00

Electric Ferrosilicon	
	Per Gross Ton Delivered
50%	\$83.50
75%	130.00

Per Gross Ton Furnace		Per Gross Ton Furnace	
10%	\$35.00	12%	\$39.00
11%	37.00	14 to 16%	39.00

Bessemer Ferrosilicon			
F.o.b. Jackson County, Ohio, Furnace			
Per Gross Ton		Per Gross Ton	
10%	\$25.00	13%	\$29.00
11%	26.00	14%	31.00
12%	27.00	15%	33.00

Silvery Iron			
F.o.b. Jackson County, Ohio, Furnace			
Per Gross Ton		Per Gross Ton	
6%	\$21.00	11%	\$24.00
7%	21.50	12%	25.00
8%	22.00	13%	27.00
9%	22.50	14%	29.00
10%	23.00	15%	31.00

Delivered prices at Chicago are about 50c. a ton below this schedule.

Other Ferroalloys	
Ferrotungsten, per lb. contained metal del'd	\$4.80 to \$1.40
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovandium, per lb. contained vanadium, f.o.b. furnace	\$3.15 to \$3.65
Ferrocobaltititanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	\$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	\$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	\$122.50

Fluxes and Refractories	
Fluorspar	
	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	\$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	\$17.00 to \$17.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick	
	Per 1000 f.o.b. Works
High-Heat	Intermediate
Duty Brick	Heavy Duty Brick
Pennsylvania	\$43.00 to \$46.00
Maryland	43.00 to 46.00
New Jersey	50.00 to 65.00
Ohio	43.00 to 46.00
Kentucky	43.00 to 46.00
Missouri	43.00 to 46.00
Illinois	43.00 to 46.00
Ground fire clay, per ton	7.00

Silica Brick	
	Per 1000 f.o.b. Works
Pennsylvania	\$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	\$8.50 to 10.00

Magnesite Brick	
	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	\$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick	
	Per Net Ton
Standard size	\$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts	
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)	
	Per Cent Off List
Machine bolts	73
Carriage bolts	73
Lag bolts	73
Plow bolts, Nos. 1, 2, 3 and 7 heads	73
Hot-pressed nuts, blank or tapped, square	73
Hot-pressed nuts, blank or tapped, hexagons	73
C.p.e. and t. square or hex. nuts, blank or tapped	73
Washers	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.
 †Bolts with rolled thread up to and including 1/2 in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts	
	Per Cent Off List
Semi-finished hexagon nuts	73
Semi-finished hexagon castellated nuts, S.A.E.	73
Stove bolts in packages, P'gh	80, 10, 10 and 5
Stove bolts in packages, Chicago	80, 10, 10 and 5
Stove bolts in packages, Cleveland	80, 10, 10 and 5
Stove bolts in bulk, P'gh	80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Chicago	80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Cleveland	80, 10, 10, 5 and 2 1/2
Tire bolts	60, 10 and 10

Discounts of 73 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

Large Rivets	
(1/2-in. and larger)	
	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	\$2.75
F.o.b. Chicago	2.85

Small Rivets	
(7/16-in. and smaller)	
	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws	
(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)	
	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

▲▲▲ Mill Prices of Finished Iron and Steel Products ▲▲▲

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c.
F.o.b. Chicago.....	1.70c.
Del'd Philadelphia.....	1.80c.
Del'd New York.....	1.93c.
F.o.b. Cleveland.....	1.60c. to 1.65c.
F.o.b. Lackawanna.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
C.i.f. Pacific ports.....	2.10c.
F.o.b. San Francisco mills.....	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.....	1.70c.
F.o.b. Birmingham, mill lengths.....	1.75c. to 1.80c.

Rail Steel

F.o.b. mills, east of Chicago dist.....	1.55c.
F.o.b. Chicago Heights mill.....	1.60c. to 1.65c.
Del'd Philadelphia.....	1.84c. to 1.89c.

Iron

Common iron, f.o.b. Chicago.....	1.70c.
Refined iron, f.o.b. P'gh mills.....	2.75c.
Common iron, del'd Philadelphia.....	2.09c.
Common iron, del'd New York.....	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c.
F.o.b. Chicago.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
Del'd Cleveland.....	1.78 1/2 c.
Del'd Philadelphia.....	1.80 1/2 c.
F.o.b. Coatesville.....	1.70c.
F.o.b. Sparrows Point.....	1.70c.
F.o.b. Lackawanna.....	1.70c.
Del'd New York.....	1.88c.
C.i.f. Pacific ports.....	2.05c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c.
F.o.b. Chicago.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
F.o.b. Lackawanna.....	1.70c.
F.o.b. Bethlehem.....	1.70c.
Del'd Cleveland.....	1.78 1/2 c.
Del'd Philadelphia.....	1.71c. to 1.76c.
Del'd New York.....	1.85 1/2 c.
C.i.f. Pacific ports.....	2.15c. to 2.25c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh.....	1.65c. to 1.70c.
Wider than 6 in., P'gh.....	1.55c. to 1.60c.
6 in. and narrower, Chicago.....	1.80c.
Wider than 6 in., Chicago.....	1.70c.
Cooperage stock, P'gh.....	1.90c.
Cooperage stock, Chicago.....	2.00c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill.....	2.00c. to 2.10c.
Bars, f.o.b. Chicago.....	2.00c. to 2.10c.
Bars, Cleveland.....	2.00c. to 2.10c.
Bars, Buffalo.....	2.00c. to 2.10c.
Shafting, ground, f.o.b. mill.....	2.45c. to 3.40c.
Strips, P'gh.....	2.25c. to 2.35c.
Strips, Cleveland.....	2.25c. to 2.35c.
Strips, deliv'd Chicago.....	2.53c. to 2.63c.
Strips, Worcester.....	2.50c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland.....	3.40c. to 3.50c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails.....	\$1.90 to \$2.00
Cement coated nails.....	1.90 to 2.00
Galvanized nails.....	3.95 to 4.05

	Base per Lb.
Polished staples.....	2.40c. to 2.50c.
Galvanized staples.....	2.65c. to 2.75c.
Barbed wire, galvanized.....	2.60c. to 2.70c.
Annealed fence wire.....	2.10c. to 2.20c.
Galvanized wire, No. 9.....	2.55c. to 2.65c.
Woven wire fence (per net ton to retailers).....	\$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage.....	2.30c.
Spring wire.....	3.80c.

(Carload lots, f.o.b. Chicago)

Wire nails.....	\$2.00 to \$2.05
Annealed fence wire.....	2.40c. to 2.50c. (lb.)
Bright hard wire to manufacturing trade.....	2.35c.

Anderson, Ind., mill prices are ordinarily \$1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill \$2 a ton over Pittsburgh, and Birmingham mill \$3 a ton over Pittsburgh.

Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh.....	1.90c.
No. 10, blue annealed, f.o.b. Chicago dist.....	2.00c.
No. 10, blue annealed, del'd Phila.....	2.32c.
No. 10, blue annealed, B'ham.....	2.10c. to 2.15c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh.....	2.05c. to 2.15c.
No. 13, f.o.b. Chicago dist.....	2.15c. to 2.25c.
No. 13, del'd Philadelphia.....	2.34c. to 2.44c.
No. 13, blue annealed, B'ham.....	2.25c. to 2.30c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh.....	2.35c. to 2.45c.
No. 24, f.o.b. Chicago dist. mill.....	2.45c. to 2.55c.
No. 24, del'd Philadelphia.....	2.64c. to 2.74c.
No. 24, f.o.b. Birmingham.....	2.55c. to 2.60c.

Steel Furniture Sheets

No. 24, f.o.b. P'gh.....	3.60c.
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Galvanized

No. 24, f.o.b. Pittsburgh.....	2.90c. to 3.00c.
No. 24, f.o.b. Chicago dist. mill.....	3.10c.
No. 24, del'd Cleveland.....	3.08 1/2 c. to 3.18 1/2 c.
No. 24, del'd Philadelphia.....	3.24c. to 3.29c.
No. 24, f.o.b. Birmingham.....	3.15c.

Continuous Mill Sheets

No. 10 gage.....	1.75c.
No. 13 gage.....	1.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh.....	2.65c. to 2.70c.
No. 28, f.o.b. Chicago dist. mill.....	2.75c. to 2.80c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh.....	3.30c. to 3.40c.
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Long Ternes

No. 24, 8-lb. coating, f.o.b. mill.....	3.45c. to 3.55c.
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Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh.....	3.70c.
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Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills.....	\$5.00
Standard cokes, f.o.b. Gary.....	5.10

Terne Plate

	(F.o.b. Morgantown or Pittsburgh)
(Per Package, 20 x 28 in.)	
8-lb. coating I.C. \$10.30 25-lb. coating I.C. \$15.20	
15-lb. coating I.C. 12.90 30-lb. coating I.C. 16.00	
20-lb. coating I.C. 14.00 40-lb. coating I.C. 17.80	

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.	Alloy Differential
S.A.E. Series	
Numbers	
2000 (1 1/2% Nickel).....	\$0.25
2100 (1 1/2% Nickel).....	0.55
2300 (3 1/2% Nickel).....	1.50
2500 (5% Nickel).....	2.25
3100 Nickel Chromium.....	0.55
3200 Nickel Chromium.....	1.35
3300 Nickel Chromium.....	3.80
3400 Nickel Chromium.....	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum).....	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum).....	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel).....	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium).....	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium).....	0.45
5100 Chromium Spring Steel.....	0.20
6100 Chromium Vanadium Bar.....	1.20
6100 Chromium Vanadium Spring Steel.....	0.95
9250 Silicon Manganese Spring Steel (flats).....	0.25
Rounds and squares.....	0.50
Chromium Nickel Vanadium.....	1.50
Carbon Vanadium.....	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is 3/4c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2 1/2 in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill.....	\$43.00
Light (from billets), f.o.b. mill.....	34.00
Light (from rail steel), f.o.b. mill.....	32.00
Light (from billets), f.o.b. Ch'go mill.....	36.00

Track Equipment

	Base per 100 Lb.
Spikes, 3/4 in. and larger.....	\$2.80
Spikes, 1/2 in. and smaller.....	2.80

Spikes, boat and barge.....	\$3.00
Tie plate, steel.....	1.95
Angle bars.....	2.75
Track bolts, to steam railroads.....	\$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count.....	.75 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld			Iron		
Inches	Steel	Galv.	Inches	Black	Galv.
1/4	47	21 1/2	1/4 and 3/8	+11	+96
1/4 to 3/8	53	27 1/2	1/2	23	5
1/2	58	44 1/2	3/4	28	11
3/4	62	50 1/2	1 and 1 1/4	31	15
1 to 3	64	52 1/2	1 1/2 and 2	35	18
Lap Weld					
2	57	45 1/2	2	23	9
2 1/2 to 6	61	49 1/2	2 1/2 to 3 1/2	28	13
7 and 8	58	45 1/2	4 to 6	30	17
9 and 10	56	43 1/2	7 and 8	29	16
11 and 12	55	42 1/2	9 to 12	26	11
Butt Weld, extra strong, plain ends					
1/4	43	25 1/2	1/4 and 3/8	+13	+48
1/4 to 3/8	49	32 1/2	1/2	23	7
1/2	55	44 1/2	3/4	28	12
3/4	60	49 1/2	1 to 2	34	18
1 to 1 1/2	62	51 1/2			
2 to 3	63	52 1/2			
Lap weld, extra strong, plain ends					
2	55	44 1/2	2	29	13
2 1/2 to 4	59	48 1/2	2 1/2 to 4	34	20
4 1/2 to 6	58	47 1/2	4 1/2 to 6	33	19
7 to 8	54	41 1/2	7 and 8	31	17
9 and 10	47	34 1/2	9 to 12	21	8
11 and 12	46	33 1/2			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1 1/2 points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2 1/2%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2 1/2 points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel	Charcoal Iron
2 in. and 2 1/2 in.. 38	1 1/2 in. 1
2 1/2 in.—2 3/4 in.. 46	1 3/4 in. 8
3 in. 52	2 in.—2 1/2 in.. 13
3 1/2 in.—3 3/4 in.. 54	2 1/2 in.—2 3/4 in.. 16
4 in. 57	3 in. 17
4 1/2 in. to 6 in.. 46	3 1/2 in. to 3 3/4 in.. 18
	4 in. 20
	4 1/2 in. 21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn		Hot Rolled	
1 in. 61	3 in. 46	2 and 2 1/2 in.. 38	3 1/4 to 3 1/2 in.. 54
1 1/4 to 1 1/2 in.. 53	3 1/2 to 3 3/4 in.. 48	2 1/2 and 2 3/4 in.. 46	4 in. 57
1 3/4 in. 37	4 in. 51	3 in. 52	4 1/2, 5 and 6 in.. 40
2 to 2 1/4 in.. 32		2 1/2 to 2 3/4 in.. 40	

Beyond the above base discount a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads).....	55
Carbon, 0.30% to 0.40% base.....	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Fabricated Structural Steel

Awards of 43,000 Tons Include Bridges of 16,000 Tons— New Projects Total 40,000 Tons

AWARDS of fabricated structural steel, which have reached rather small totals recently, advanced this week to about 43,000 tons, the largest since late in October. Large contributors to the total were bridges over the Hackensack and Passaic rivers in New Jersey, requiring 16,000 tons, transmission towers and spillway gates at Safe Harbor, Pa., 7385 tons, and the Hampshire House Apartments on Central Park South, New York, 3770 tons.

New projects of about 40,000 tons register a slight decline from 45,000 tons a week ago and 62,000 tons two weeks ago. Among the larger projects are bridges at Niagara Falls, N. Y., 12,000 tons, a 30-story bank and office building at Twelfth and Market Streets, Philadelphia, 8000 tons, highway bridges in Tennessee, 2000 tons, a State capitol building at Baton Rouge, La., 3100 tons, and a power plant in Minneapolis for the North States Power Co., 2000 tons. Awards follow:

North Atlantic States

PALMER, MASS., 225 tons, State bridge, to Boston Bridge Works, Inc.
NEW YORK, 750 tons, apartment building at 850 Amsterdam Avenue, to Harris Structural Steel Co.
NEW YORK, 1700 tons, apartment building at 850 Fifth Avenue, to George A. Just.
NEW YORK, 3770 tons, Hampshire House Apartments, 150 Central Park South, to Fort Pitt Bridge Works Co.
NEW YORK, 700 tons, apartment building on East Fifty-fourth Street, to Lehigh Structural Steel Co.
NEW YORK, 500 tons, apartment house on Amsterdam Avenue, to Westerly Structural Steel Co.
STATE OF NEW JERSEY, 16,000 tons, highway bridges over Hackensack and Passaic Rivers, to McClintic-Marshall Co.
JERSEY CITY, 410 tons, hospital power house, to Mullaney Iron Works.
COLLINGSWOOD, N. J., 570 tons, Masonic consistory, to Bethlehem Fabricators, Inc.
PHILADELPHIA, 224 tons, building for Abbott's Dairy Co., to Robinson Iron & Steel Co.
PITTSBURGH, 340 tons, anchorage for Tenth Street bridge, to Fort Pitt Bridge Works Co.
SAFE HARBOR, PA., 7385 tons; transmission towers, 4300 tons, for Water Power Corp., to Blaw-Knox Co., spillway gates, 3085 tons, to Newport News Shipbuilding & Dry Dock Co.
BUFFALO, 400 tons, building for University of Buffalo, to Mahon Structural Steel Co.
SYRACUSE, N. Y., 250 tons, Forest Hills School, to Syracuse Engineering Co.

The South

CHARLOTTE, N. C., 325 tons, plant for Charlotte Pipe & Foundry Co., to Ingalls Iron Works.
NEW ORLEANS, 120 tons, new Y. M. C. A. building, to Southern Steel Works Co.
BATON ROUGE, LA., 300 tons, building for Standard Oil Co., to a local fabricator.
LUBBOCK, TEX., 400 tons, temple building, to Ben Sibbitt Iron & Foundry Co.

Central States

HAMMOND, IND., 400 tons, high school, to McClintic-Marshall Co.
STERLING, ILL., 190 tons, coliseum, to Davenport Machine & Foundry Co.
DAVENPORT, IOWA, 500 tons, theater and office building, to Rock Island Bridge & Iron Works.
MOSEBY, MO., 1100 tons, bridge for Milwaukee Road, to American Bridge Co.

Western States

OMAHA, NEB., 680 tons, Creighton Avenue viaduct for Union Pacific Railroad, to Omaha Steel Co.
OAKLAND, CAL., 390 tons, plates, 24-in. welded steel pipe line, East Bay Municipal Utility District, to Steel Tank & Pipe Co.
SAN FRANCISCO, 130 tons, apartment building, Twenty-fifth Avenue and Fair Oaks, to Golden Gate Iron Works.
PASADENA, CAL., 400 tons, municipal light plant, to McClintic-Marshall Co.
LOS ANGELES, 550 tons, Van De Kamp bakery, to McClintic-Marshall Co.
LOS ANGELES, 100 tons, addition to Crane Co. warehouse, to Consolidated Steel Corp.
OGDEN, UTAH, 200 tons, Post Office extension, to an unnamed fabricator.
ALBUQUERQUE, N. M., 450 tons, Post Office, to an unnamed bidder.

Canada

VANCOUVER, B. C., 3500 tons, Burrard bridge, to Dominion Bridge Co.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

FRAMINGHAM, MASS., 110 tons, telephone building.
NEW LONDON, CONN., 500 tons, building for the Coast Guard; previously reported as 130 tons.
NEW YORK, 1000 tons, apartment building on West Twenty-third Street.
NEW YORK, 10,000 tons, penitentiary on Rikers Island; previously reported as 7000 tons.
NEW YORK, 670 tons, apartment building on East Eighty-eighth Street.
BROOKLYN, unstated tonnage, addition to Victory Memorial Hospital.
PHILADELPHIA 8000 tons, bank building at Twelfth and Market Streets; Fuller Construction Co., general contractor.
NIAGARA FALLS, N. Y., 12,000 tons, Grand Island bridges.
BUFFALO, 2000 tons, grade crossing elimination.

The South

STATE OF TENNESSEE, 2000 tons, highway bridges.
BATON ROUGE, LA., 3100 tons, State Capitol.

Central States

CLEVELAND, 600 tons, James Ford Rhodes School.
MINNEAPOLIS, 2000 tons, power plant for North States Power Co.
TOLEDO, 1400 tons, Y. M. C. A. building.
CLEVELAND, 400 tons, addition to South High School.

Western States

OKLAHOMA CITY, 4000 tons, First National Bank & Trust Co.; American Bridge Co., low bidder.
DENVER, 243 tons, plates, two tanks for United States Bureau Public Roads at Boulder City, Nev.; bids Dec. 12.
TACOMA, WASH., 600 tons, plates, 30-in. welded steel pipe line; Birchfield Boiler Co., low bidder.
OLYMPIA, WASH., 200 tons, bridge over Snoqualmie River; bids Nov. 25.
OLYMPIA, 100 tons, bridge over Klickitat River; bids Nov. 25.
SEATTLE, 300 tons, warehouse for Puget Sound Navy Yard; bids opened.
SAN FRANCISCO, 7500 tons, Olympic Club; Pacific Coast Steel Corp., low bidder.
SANTA CRUZ, CAL., 350 tons, plates, 20-in. welded steel pipe line; bids rejected.

Canada

TORONTO, 2000 tons, Board of Education, 155 College Street, for Withrow Avenue school.

Railroad Equipment

Chicago Great Western Orders 300 Hopper Cars

WITH the placing of 300 hopper cars by the Chicago Great Western and the closing of bids by the Santa Fe on upward of 1500 cars and an inquiry from the New York Central for 50 locomotives, the outlook for the taking of steel for railroad work is slightly better. The Northern Pacific will rebuild 3000 freight cars in its own shops, and the Missouri Pacific has also embarked upon a program of repair work in its own shops. Details of the week's business follow:

Fruit Growers Express has awarded order for 100 underframes for refrigerator cars to Stems-Stempel division of Standard Steel Car Co.

Western Fruit Express has ordered 100 underframes from Greenville Steel Car Co.

Seaboard By-Products Coal Co., Pittsburgh, is asking for bids for the repair of 248 55-ton hopper cars.

Youngstown Sheet & Tube Co. is inquiring for 20 to 40 gondola car bodies.

Atchison, Topeka & Santa Fe opened bids Tuesday on upward of 1500 freight cars and a number of passenger cars.

Interborough Rapid Transit Co., New York, opened bids Wednesday on 289 subway cars.

Litchfield & Madison has ordered two 2-8-2 type locomotives from American Locomotive Co.

Chicago Great Western has ordered 300 hopper cars from Pullman Car & Mfg. Corp.

New York Central has issued an inquiry for 50 Hudson-type locomotives and probably will send out an inquiry soon for freight cars. The number may be as many as 5000.

▲▲▲ Non-Ferrous Metal Markets ▲▲▲

Copper Inactive, Lower—Tin Quiet—Lead Steady— Zinc Weak

NEW YORK, Nov. 25.

Copper

For the first time in many years, there are two prices for electrolytic copper. Primary producers adhere to the 12c. quotation and custom smelters are offering the metal at 10.50c., delivered in the Connecticut Valley. The export price is unchanged from last week at 12.30c., c.i.f. usual European ports. Virtually no metal is being sold at 12c. The only business that is being done, and that not large, is at 10.50c. Domestic consumers are evidently well covered into the first quarter, and do not need to enter the market. Such demand as there is comes from small consumers who buy for immediate needs only. With the price situation as it is, foreign consumers naturally hesitate to buy any more than is necessary. Foreign sales, therefore, have been very light in the last week, totaling not more than 1500 to 2000 tons and bringing the month's total to about 69,500 tons.

It will be interesting to note what the quotation, regarded as official by the trade, will be for electrolytic copper for the week ended Wednesday, Nov. 26. Should that quotation be the average between the two prevailing prices, or 11.25c., it would affect adversely the business of custom smelters who are selling at 10.50c., with their intake based upon an 11.25c. price in such an event.

Tin

On only one day during the past week (Wednesday, Nov. 19) was any business reported. On that day there were fair sales of spot tin. Since then, up to and including today, the market has been stagnant, with practically no sales reported. Yesterday the market closed easy, with metal offered by sellers at ¼c. a lb. concessions, but with no buyers. Today a little business was done, with spot Straits tin quoted at 26.12½c., New York. Consumers are covered far ahead and have no need to buy. There is plenty of tin, with the world's visible supply at approximately 39,000 tons and with a prospect of this increasing by the end of the month. Straits shipments up to Nov. 22 were 6075 tons, with the prospect of the month's total reaching 8000 tons.

For several weeks the market has been oscillating between 25c. to 27c. a lb. and buying has only appeared at the lower levels. London prices today were a shade higher than a week ago, with spot standard quoted at £113 17s. 6d., future standard at £115 5s. and spot Straits at £118 5s. The Singapore price today is £119 17s. 6d.

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Nov. 25	Nov. 24	Nov. 22	Nov. 21	Nov. 20	Nov. 19
Lake copper, New York.....	12.12½	12.12½	12.12½	12.12½	12.12½	12.12½
Electrolytic copper, N. Y.*....	10.25	10.25	10.25	10.25	10.25	10.75
Straits tin, spot, N. Y.	26.12½	25.87½	26.12½	26.37½	25.87½
Zinc, East St. Louis.....	4.10	4.12½	4.15	4.20	4.25	4.30
Zinc, New York.....	4.45	4.47½	4.50	4.55	4.60	4.75
Lead, East St. Louis.....	4.95	4.95	4.95	4.95	4.95	4.95
Lead, New York.....	5.10	5.10	5.10	5.10	5.10	5.10

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Stocks of tin in British warehouses on Nov. 22 were 22,248 tons, a decline for the week of 243 tons.

New hours for trading have been announced by the National Metal Exchange—10 to 11 in the morning and 2 to 3 in the afternoon instead of 10 a.m. to 3 p.m.

Lead

The market has turned quiet, but prices are firm at 4.95c., St. Louis, or 5.10c., New York, the contract price of the leading interest. Business is confined to carload and small lots for immediate needs and there is very little forward buying.

Zinc

Further weakness has developed almost each day, and prime Western zinc

was available today at 4.10c. to 4.12½c., East St. Louis, or 4.45c. to 4.47½c., New York. The market is gradually approaching the 3.90c. to 4c. level, which was the low point recently. Because forward bookings are not heavy, it is believed by some that buying will soon appear and that the market will not touch the former low price on this movement.

Ore prices at Joplin are firm at \$26, the week's sales having been 6150 tons. Production is estimated at 8000 tons with shipments about the same, leaving the surplus estimated at 41,987 tons, close to the largest of the year.

Antimony

Demand for Chinese metal is very light and quotations for spot delivery

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	18.67½c.
Copper, hot rolled, base sizes	21.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes.....	23.25c.
Seamless Tubes—	
Brass	23.50c.
Copper	22.75c.
Brass Rods	16.87½c.
Brazed Brass Tubes.....	26.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	9.75c. to 10.25c.
Zinc sheets, open.....	10.75c. to 11.25c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	27.75c. to 28.75c.
Tin, bar	29.75c. to 30.75c.
Copper, Lake	13.00c.
Copper, electrolytic	12.75c.
Copper, casting	12.50c.
Zinc, slab	5.75c. to 6.75c.
Lead, American pig.....	6.00c. to 7.00c.
Lead, bar	8.00c. to 9.00c.
Antimony, Asiatic	9.50c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)...	24.00c. to 25.00c.
Alum. ingots, No. 12 alloys	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½.....	19.00c. to 20.00c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	30.25c.
Tin, bar	32.25c.
Copper, Lake	13.13c.
Copper, electrolytic	13.13c.
Copper, casting	12.75c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig.....	5.75c. to 6.00c.
Lead, bar	8.50c.
Antimony, Asiatic	11.50c.
Babbitt metal, medium grade.....	15.25c.
Babbitt metal, high grade.....	35.00c.
Solder, ½ and ½.....	19.75c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses. (Because of the uncertain market, prices quoted are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	8.25c.	9.50c.
Copper, hvy. and wire	8.00c.	9.25c.
Copper, light and bottoms	7.25c.	8.25c.
Brass, heavy	5.00c.	6.25c.
Brass, light.....	4.00c.	5.00c.
Hvy. machine composition	7.50c.	8.50c.
No. 1 yel. brass turnings	5.00c.	6.00c.
No. 1 red brass or compos. turnings..	7.00c.	8.00c.
Lead, heavy	4.00c.	4.50c.
Lead, tea.....	2.50c.	3.00c.
Zinc	2.25c.	2.75c.
Sheet aluminum.....	7.50c.	9.50c.
Cast aluminum.....	6.00c.	8.00c.

are 7.15c., with futures at 7c., New York, duty paid.

Aluminum

Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Nov. 25.—Sales are quiet, probably as the result of weakness shown in quotations on copper. Prices for tin are higher, while quotations on zinc have eased to lower levels.

Prices per lb. in carload lots: Lake copper, 12.12½c.; tin, 27c.; lead, 5.05c.; zinc, 4.20c.; in less-than-carload lots, antimony, 8.37½c. On old metals we quote copper wire, crucible shapes and copper clips, 8c.; copper bottoms, 7c. to 7.50c.; red brass, 7c. to 7.50c.; yellow brass, 5c. to 5.50c.; lead pipe, 3.75c. to 4c.; zinc, 1.50c. to 1.75c.; pewter, No. 1, 15c.; tin-foil, 16c.; block tin, 22c.; aluminum, 6.50c. to 7c.; all being dealers' prices for less-than-carload lots.

Reinforcing Steel

Merchandise Mart in St. Louis Will Take 3325 Tons

AWARDS of reinforcing steel the past week fell below those of the preceding week, totaling only 3850 tons. Except for 1500 tons for a State highway in New Jersey, tonnages were in moderate volume. New inquiries will add 5100 tons to the work pending and include 3325 tons for a

merchandise mart in St. Louis. Awards follow:

SPRINGFIELD, MASS., 540 tons, hospital, to Kalman Steel Co.

BOSTON, 160 tons, medical school clinic, to Truscon Steel Co.

HARTFORD, CONN., 100 tons, junior high school, to an unnamed bidder.

BERGEN COUNTY, N. J., 1500 tons, State highway route 4, section 3; placed by George M. Brewster & Son with Kalman Steel Co.

PLEASANTVILLE, N. Y., 100 tons, undercrossing for Westchester County Park Commission, to Concrete Steel Co.

ALBUQUERQUE, N. M., 200 tons, Post Office, to an unnamed bidder.

LOS ANGELES, 400 tons, State building, to Truscon Steel Co.

LOS ANGELES, 100 tons, Van De Kamp bakery, to an unnamed bidder.

LOS ANGELES, 100 tons, garage, 1407 North Gower Street, to an unnamed company.

LOS ANGELES, 350 tons, warehouse, Ninth and Alameda Streets, to Pacific Coast Steel Corp.

LOS ANGELES, 200 tons, warehouse, Terminal Island, to an unnamed bidder.

VENTURA, CAL., 100 tons, new jail, to Concrete Engineering Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEW YORK, 900 tons, foundations for penitentiary, Riker's Island, Department of Correction; revised general contract bids to be taken Dec. 3.

NEW YORK, 600 tons, subway route 108, section 9, Queens; Arthur A. Johnson Corp., New York, low bidder on general contract.

BROOKLYN, 450 tons, subway route 107, section 8; Triest Contracting Corp.,

New York, low bidder on general contract.

CREEDMORE, N. Y., 110 tons, tunnel for State hospital; general contract bids to be taken Nov. 26.

BRENTWOOD, N. Y., 190 tons, tunnel for Pilgrim Hospital; revised bids to be taken.

BROOKLYN, 100 tons, Harway Avenue bridge; W. H. Gahagan, Inc., low bidder on general contract.

BALTIMORE, 200 tons, high school for colored pupils.

CHICAGO, 220 tons, Goldberg store.

CHICAGO, 1000 tons, grain elevator.

CHICAGO, 500 tons, addition to Grant Park stadium; Holabird & Root, architects.

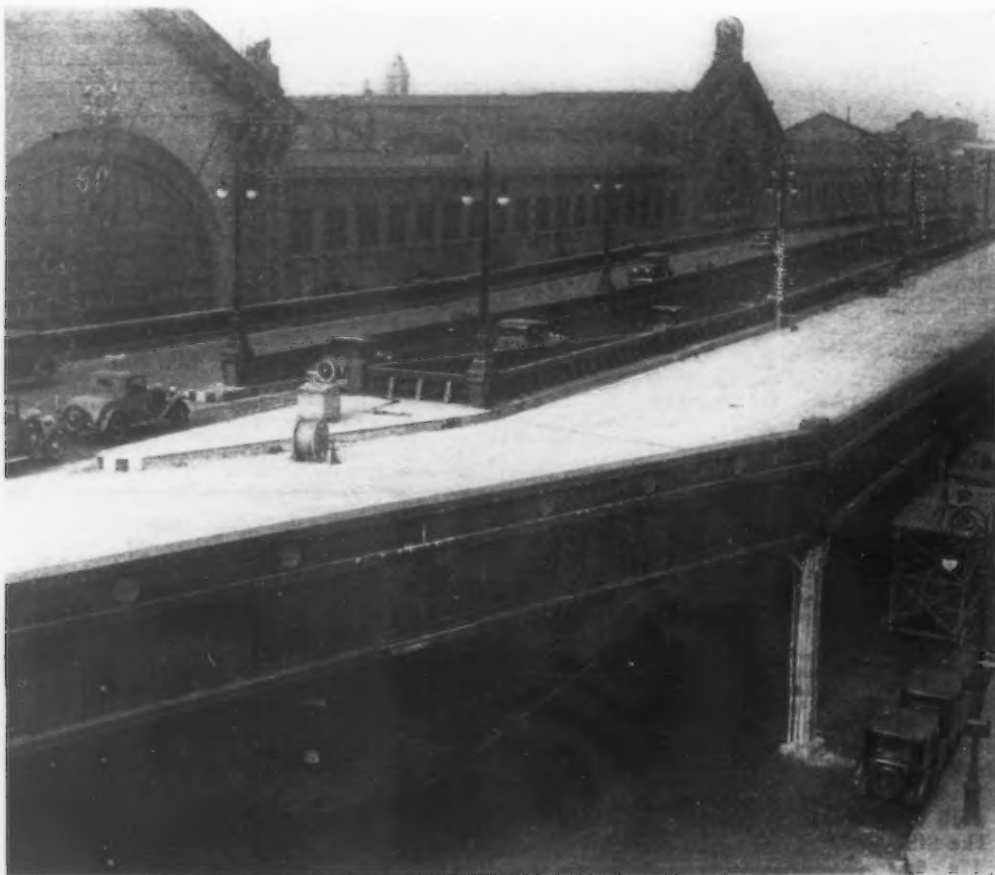
BLOOMINGTON, ILL., tonnage being estimated, Post Office.

ST. LOUIS, 3325 tons, merchandise mart for St. Louis Mart, Inc., previously reported as 300 tons; W. J. Knight & Co., engineers.

To Show Rocker Action of Chain Drive

A novel method of showing the true rocker action of the Morse joint for a chain drive has been improved upon and will be shown by the Morse Chain Co., Ithaca, N. Y., at the Power Show, Grand Central Palace, New York, Dec. 1 to 6. This display enables the observer to watch the action of the rocker joint while the chain is in operation, and demonstrates the efficiency of this type of chain drive.

The chain speed reducer and flexible coupling, also, will be shown in operation, to demonstrate fully how the chain-type coupling takes care of end thrust and shaft misalignments.



NEW YORK'S ELEVATED HIGHWAY

NEW YORK'S West Side Elevated Express highway, the first section of which has been opened to traffic, will eventually extend from Canal to Seventy-second Street, connecting with Riverside Drive. Construction of the first section from Canal to Twenty-second Street required about 24,000 tons of fabricated structural steel and the completed highway will use about 60,000 tons. It provides a roadway for six lanes of motor traffic, three northbound and three southbound and is exclusively for the use of passenger automobiles, commercial vehicles using the street beneath the structure.

Work on New Models Brings More Activity in Automobile Industry

Detroit, Nov. 24.

PRODUCTION of new models by several automobile manufacturers has given a measure of encouragement to Detroit and has provided employment for 6000 to 7000 workers in the past few weeks. Chevrolet leads the group, having on its payroll 26,000 men with an additional 10,000 needed in January. Through W. S. Knudsen, president, it has announced that 1930 output will be 800,000 cars, and that it expects to make more than 1,000,000 next year. It is interesting to contrast this showing with Ford's estimated assemblies of 1,500,000 cars this year.

During a period which normally brings a contraction of activities, Chevrolet is going ahead with an ambitious program. If the present schedule is not modified, the company will turn out approximately 175,000 cars in November, December and January. Its expansion of operations is closely followed by that of the Hudson Motor Car Co., which has departed from a trade custom by publishing 1931 prices before new models are ready to be sold. The base list prices of the Hudson and Essex have been reduced \$175 and \$170 respectively, which puts the Essex down close to the Chevrolet, while the Hudson has dipped to a new low figure, the Hudson eight, with 119-in. wheelbase, carrying a listing of \$875 to \$1,095, f.o.b. Detroit.

Distributors and dealers have seen the 1931 Oakland eight and Pontiac six, but neither is likely to be revealed to the public until the January show. However, the Oakland plant and the Fisher Body factory at Pontiac have augmented their forces with several thousand workers as production gets under way. Willys-Overland at Toledo also has taken on a considerable number of former employees as it steps up work on next year's products. Oldsmobile likewise is preparing something new, although little is heard about its plans. Hupp has recently brought out a Victoria model, the first change since last January, and is getting a series of eight-cylinder cars ready for the New York show. Other companies developing cars for presentation in January are Dodge, DeSoto and Marmon. The latter intends to build a 16-cylinder car powered by an all-aluminum engine. This engineering feat is the accomplishment of

Chevrolet's production this year will be 800,000 cars, with 1,000,000 estimated for 1931. Output in November, December and January will total 175,000 units.

* * *

Lessened cost of raw materials and parts helps automobile manufacturers to sustain profits, despite a substantial decrease in retail prices of their products.

* * *

Detroit metal-working industries, including steel plants, are urging the piping of natural gas from eastern Kentucky to Detroit.

* * *

Chevrolet, Hudson - Essex, Oakland-Pontiac, Oldsmobile, Hupp, Dodge, DeSoto and Marmon are working on new models.

Howard Marmon, vice-president, who has been perfecting it for many years.

Ford Curtailing Production

WHILE some makers are consummating plans for introducing 1931 models, Ford is cutting down production. In the Victoria four-seat coupe, first exhibited the past week, Ford is presenting changes in body design and in the application of rustless steel. Strips have been substituted for sheets in the radiator shell by a fabricating process developed by engineers at the Rouge plant. One hesitates to predict Ford's November output, but it surely will be somewhat less than in October. December promises further restrictions, with a likelihood of the Rouge works shutting down the last half of the month for inventory purposes.

Reports persist that Ford is getting things in order to manufacture an eight-cylinder car. It is understood that Ford engineers have been experimenting with what is known as an X-type motor, with four cylinders in an upright position and four facing downward. The problem of lubricating cylinders operating upside down has been solved by the airplane people, and the X-type motor, which may be incorporated in a Ford eight,

would be fashioned much after that of an airplane. It is agreed that if Ford offers an eight, it will not be for a number of months, the company relying during the first part of next year on model A to maintain production rates. Most people believe that Ford's expenditure of \$60,000,000 this year in plant expansions is unrelated to any program which may be worked out for an eight.

Steel buying on the part of the automobile industry has been stimulated somewhat by companies making new models, notably Chevrolet. On the other hand, gains in this direction have been largely offset by reduced commitments of the Ford company as well as other manufacturers. District steel offices do not look for material improvement until the early part of 1931. The desire to keep inventories near the vanishing point at the turn of the year will retard the placing of steel orders in the immediate future.

Automobile Makers Buying Materials Cheaper

THE general downward movement of retail automobile prices has caused discussion of the way in which automobile manufacturers may meet the situation without seriously impairing their earning power. Overhead expenses have been cut sharply, and improvement in production methods has contributed to lower costs. Another important factor, sometimes overlooked, is the lessened prices of raw materials and of parts. Those companies which purchase cylinder blocks from outside sources, for example, are making contracts today which call for expenditures far below those of a year ago. A like condition exists in other products entering into the finished automobile. One may ask what the parts manufacturer is doing to keep his head above water. The answer is that he, in turn, is buying the ingredients of his product for less money than formerly, is turning to new ways and means of achieving manufacturing economies and, despite pronouncements to the contrary, in many cases is paying less for labor.

Detroit Steel Companies Want Natural Gas

BURIED in the report of John H. Morgan, statistician, to Detroit City Council on the petition of the Northern Industrial Gas Co. to pipe

natural gas from Kentucky to this city, is the significant statement, "with natural gas as a fuel, Detroit will be able to compete with Pittsburgh in the production of steel and allied products." The metal-working industry of Detroit would welcome the opportunity to get natural gas at a reasonable rate, and it is no secret that Great Lakes Steel Corp. would use it if it could be obtained economically. Mr. Morgan's report declared that a number of large industrial concerns (including automobile makers) wrote letters to the council stating that Detroit would benefit considerably by obtaining more efficient and economical fuel to be used in heat-treating, forging, tempering, steel-making and like operations. The Detroit City Gas Co. has never specialized in supplying industrial wants, its artificial gas has low B.t.u. value and its rates have been high until recently. The introduction of butane gas and the threat of natural gas have brought a rather precipitate decline. It looks as though Detroit may wait some time, however, before it will have the benefits of natural gas. The Ford Motor Co. and Semet-Solvay Co. at present have an outlet for their coke oven gas through the Detroit City Gas Co.

Is the Bantam's Popularity Waning?

DETROIT is wondering what has happened to the supposed popularity of bantam cars. For a short time the American Austin threatened to become a serious rival for the favor of the low-priced buyer, but its production at Butler, Pa., is said to have been temporarily halted. Then Durant's much advertised Mathis, the adaptation of the small French car, was to be produced at Lansing with some 50,000 units scheduled for next year, but nothing has been said recently about plans for getting this program under way. Detroit never has thought that bantam cars would gain much favor, except as a novelty, and its conviction has deepened.

October Iron and Steel Exports Gained Slightly

WASHINGTON, Nov. 25.—Exports of iron and steel products from the United States in October totaled 131,850 gross tons, exceeding by 639 tons those of September. Imports were 38,344 tons in October, a drop of 1941 tons under the preceding month. The principal products of exportation in October were skelp, 20,061 tons; black steel sheets, 15,494 tons; tin plate, 14,029 tons; scrap, 12,156 tons, and plain structural shapes, 10,801 tons. The principal consuming markets were Canada, 65,071 tons; Japan, 9395 tons; Mexico, 6929 tons; Argentina, 6519 and Chile, 5995 tons.

The principal items of importation were pig iron, 13,552 tons; structural shapes, 4881 tons; scrap, 4336 tons; hoops, 2444 tons, and ferromanganese, 2247 tons. The principal supplying markets were India, Germany, United Kingdom, Belgium and Canada.

Ban Convict-Made Imports

New Treasury Regulations May Affect Manganese Ore From Russia

WASHINGTON, Nov. 25.—Treasury regulations issued yesterday placing upon the consignor and importer the burden of proof that incoming merchandise from abroad is not mined, produced or manufactured by convict labor may possibly affect shipments of manganese ore received in this country from Russia. It is generally doubted, however, that it will since it is understood that no evidence has been submitted to prove that Russian ore is produced by this class of labor. Nevertheless, the fight of the American Manganese Producers' Association is not based entirely on the charge of dumping. It is under the anti-dumping act that the association has pressed its claims most persistently, but actually its first charge was that manganese ore in Russia is produced by convict labor and that claim is included with the charge of dumping.

The first test of the regulations is expected to be applied to shipments of pulpwood from Russia, followed probably by similar action with regard to Russian lumber imports. Next may come application of the regulations as to anthracite coal from Russia. The prospect, therefore, is that action as to manganese ore under these particular regulations, if taken at all, is not a matter of the near future. The Bureau of Customs about two weeks ago received the brief of the American Manganese Producers' Association, which emphasizes the charge of dumping of ore from Russia, and it is understood that a reply brief now is being prepared by the American Iron and Steel Institute. A decision is not likely for a month or so.

Directed at Russia

The regulations issued yesterday apply to all countries, but actually are directed at Russia because so far as known the charge of convict-labor-produced imports has not been made against other countries. The outstanding feature of the regulations, issued under section 307 of the Hawley-Smoot act, is that the complaining domestic interest is not required to prove that the offending imports are produced by convict labor. Rather the consignor and importer are required to accept that responsibility. The regulations are stringent.

They require an affidavit from a foreign seller or indirectly from the last owner in the country of origin that the goods are not produced by convict labor. The affidavit must be taken before a consul or an officer authorized to issue an oath or affirmation. Since the United States has no diplomatic relations with Russia, it

has no consuls in Russia and there the "authorized officer" would accept the oath. It is understood that an officer of the country would be accepted as the proper authority. False affidavits would be subject to laws against forgery and could be dealt with by embargoing shipments. There is also required a certificate of country of origin, to be sworn to by the owner or seller of the goods. Private or commercial invoices are likewise required in the absence of consular invoices.

Importer Must Take Oath

The importer must also take oath to determine the source of origin, not only of the country, but locality, etc., and will be bonded to the domestic value of the shipments which the commissioner of customs found to be convict produced. Unless the finding is disproved the shipments will be ordered returned to the country or origin, or, if not returned, they will be destroyed. Approval of the Secretary of the Treasury, however, will have to be given to support the finding of the commissioner of customs. A collector of customs also may hold up entries when he suspects the goods are produced by convict labor and such action would be followed by Treasury investigations.

It is recalled that last August, the Treasury Department, through Assistant Secretary Seymour Lowman, in charge of customs, embargoed Russian shipments of pulpwood, but the embargo was lifted a day or so afterward. Removal of the embargo is understood to have come at the order of the White House. The White House evidently felt that insufficient evidence existed to prove that the shipments were produced by convict labor and at the time it was pointed out that the United States has no concern as to what political system any other country has. Moreover, it was declared that prosperity of the country, especially in a period of depression, is dependent upon export business which, it was indicated, would be shut off in return for shutting off import business.

Since the new regulations reverse the matter of burden of proof, placing it upon the consignor and importer, it remains to be seen what effect they will have. It is understood that they were issued only after sufficient evidence had been gathered showing that some Russian products, particularly pulpwood and lumber, come from convict labor. Goods so produced have been banned under tariff laws of the country for the past 25 years.

To Buy Michigan Steel

National Steel Corpn. Directors Vote to Acquire
Detroit Sheet Company

DIRECTORS of the National Steel Corpn. voted Tuesday at a meeting in Pittsburgh to purchase all the property and assets and assume liabilities of the Michigan Steel Corpn., Detroit. A meeting of the stockholders of the Michigan company is being called to authorize the transaction, which has already been approved by the company's directors.

The Michigan company produces full-finished steel sheets in sizes up to 72 in. and has an annual capacity of 250,000 tons. Its plant is near the new mill of the Great Lakes Steel Corpn., a subsidiary of National Steel, which has a surplus sheet bar capacity sufficient to supply the needs of Michigan Steel.

Both the Michigan and Great Lakes

companies were inaugurated by George R. Fink, who is president of both companies as well as of National Steel.

While details of the transaction have not been announced, it is understood that Michigan Steel stockholders will receive cash and securities on a basis of approximately \$50 a share, with an option to take not over one-fourth of the consideration in stock of National Steel. The acquisition will considerably strengthen the National Steel Corpn.'s position as a maker of steel for the automobile industry. A structural mill at the Weirton Steel Co. plant is to be placed in operation about Dec. 15. The Great Lakes plant at Ecorse, Mich., began operating early in the fall.

Pittsburgh Dealers Discuss Scrapping Old Automobiles

The election of officers and a discussion of the possibilities of scrap recovery from demolishing old automobiles occupied the attention of the Pittsburgh chapter of the Institute of Scrap Iron and Steel, Inc., at a meeting on Nov. 20. The following officers were elected for the coming year: I. W. Solomon, I. W. Solomon Co., president; H. N. Trimble, H. N. Trimble Co., vice-president; Abe Cohen, Fort Pitt Tool & Supply Co., secretary, and Fred W. Wimmer, Hausman & Wimmer Co., treasurer. The executive committee will consist of the following: Ike Wilkoff, Wilkoff Co., Youngstown, chairman; J. E. Jacobson, Luria Brothers & Co.; D. L. Wilkoff, United Iron & Metal Co.; H. N. Cohn, A. H. Cohn & Sons, Butler, Pa.; Mark Kuhn, Charles Dreifus Co.; J. G. Stephens, J. G. Stephens Corpn.

Scrap Freight Rates to Be on Mileage Scale

That freight rates on scrap iron and steel will be established on a mileage basis in relation to the mileage scale of finished steel articles is becoming fixed, as the result of recent decisions of the Interstate Commerce Commission, according to a report issued by the traffic bureau of the Institute of Scrap Iron and Steel. A decision has just been rendered by the commission that the rates for scrap shipped from various points in Central and Western Trunk Line Territory to Kokomo, Ind., shall be 70 per cent of the mileage scale for iron and steel articles for Official Classification territory, to be effective not later than Jan. 26, 1931.

The Interstate Commerce Commission has already announced that it would refuse to reconsider the appeal in the Newport News Shipbuilding case, which was the first case to fix 70 per cent of the mileage scale for finished steel as the basis for scrap rates. The rates between certain points in the South to points in eastern Pennsylvania will, therefore, remain at 70 per cent of the finished steel mileage scale.

Tariffs Withdrawn on Lower Pipe Rates

WASHINGTON, Nov. 25—Tariffs proposing a reduction of 10c. per 100 lb. on wrought iron and steel pipe from Atlantic Seaboard territory to Texas points by rail-ocean-rail routes have been withdrawn. The Interstate Commerce Commission, following the action of the carriers, has vacated a previous order suspending the proposed reductions. The tariffs would have reduced the present rate of 66½c. from Philadelphia, New York and Baltimore to 55½c., with corresponding reductions from other Atlantic Seaboard points.

Change in Control of Glancy Malleable Corpn.

The Glancy Malleable Corpn., Waukesha, Wis., has passed from the ownership control of A. R. Glancy to L. A. Williams, vice-president, and L. D. Harkrider, secretary-treasurer, who have been in active charge of the business since the present company was formed in 1923. Mr. Glancy, who is a vice-president and director of the General Motors Corpn., will be chairman of the board of the Glancy corporation. P. J. E. Wood,

counsel for the company for a number of years, is president. W. H. Bennett, a Milwaukee banker, also becomes a vice-president. Messrs. Glancy, Wood, Bennett, Williams and Harkrider are on the board of directors. Mr. Glancy, as chairman of the board, will continue as active general head of the organization.

The plant was built in 1893 and operated under the name of the Waukesha Malleable Iron Co. until 1920, when it was leased for five years to the Samson Tractor Division of the General Motors Corpn. for the purpose of providing castings for its tractor plant. When General Motors discontinued the manufacture of tractors in 1922, Mr. Glancy acquired the lease.

General Electric Starts Unemployment Fund

Every employee of the General Electric Co. from president to office boy who is working 50 per cent or more of full time will contribute 1 per cent of his December wage to the company's new unemployment fund and the General Electric Co. will match such contributions dollar for dollar, it is announced by President Gerard Swope.

Under the rules of the unemployment plan, as originally announced, payments were not to be made for at least six months after its inauguration, which would not be until next January or February, but because of the unemployment emergency it was decided to start relief next month, but limit payments to a maximum of \$15 a week to employees needing assistance. It has also been decided to consider for assistance employees who may not have contributed to the plan, but who are in need of assistance.

Approximately 35,000 employees have been contributing to the plan, and on Dec. 1 they will have paid in \$350,000.

Predicts Improvement Early in New Year

J. E. Andress, president, Barnes Drill Co., Rockford, Ill., addressing 45 sales representatives of the company at the annual conference in the company's offices last week, predicted improvement in the industry beginning early next year, continuing throughout the year to the 1928 level by fall, with increasing volume thenceforth to well into 1932.

"Prosperity is incubating in economic processes and nothing can stop it," he said.

Fulton Iron Works Co., St. Louis, has been placed in charge of a creditors' committee headed by V. C. Turner of the Scullin Steel Co., St. Louis. W. F. Barnes, St. Louis Structural Steel Co., East St. Louis, Ill., is secretary of this committee. The creditors' committee is now formulating a plan for the adjustment of the indebtedness of the company.

PERSONALS

PAUL LLEWELLYN, formerly president of the Interstate Iron & Steel Co., Chicago, as announced in THE IRON AGE of Oct. 30, has been made chairman of the board of the Empire Steel Corp., Mansfield, Ohio. GEORGE M. SMITH has been appointed general superintendent; STANLEY A. RICHARDSON, chief metallurgist; FRANK B. HANDY, assistant secretary; BURTON



Paul Llewellyn

L. VERNER, purchasing agent, and ALBERT MEIHACK, open-hearth superintendent. All of the foregoing were formerly identified with the Interstate Iron & Steel Co.

H. E. JACOBSON has been named as Chicago district representative, with office at 205 West Wacker Drive, for the heating division of the Wickes Boiler Co., Saginaw, Mich.

T. I. PHILLIPS, formerly superintendent of metal stamping at the AB Building, Nuttall works, Westinghouse Electric & Mfg. Co., Pittsburgh, has been appointed works manager, succeeding H. A. HOUSTON, who has resigned. W. H. HIMES, who has been in the mechanical engineering department at East Pittsburgh, has been made manager of the engineering department at Nuttall works, succeeding L. F. BURNHAM, also resigned. L. R. BOTSAL, recently industrial manager of the central district for the Nuttall division, has been appointed gearing apparatus manager, succeeding E. E. BOON.

RALPH M. BOWMAN has been appointed purchasing agent of the Republic Steel Corp., succeeding W. J. MASSMAN, who has resigned. Mr. Bowman formerly was purchasing agent of the Central Alloy Steel

Corp., and more recently was buyer of raw materials for Republic. C. A. ILGENFRITZ is director of purchases of the corporation.

SEVERN P. KER, president, Sharon Steel Hoop Co., with plants at Sharon, Pa., Lowellville, Ohio, and Youngstown, is about to resign after 20 years of service, to become chairman of the board of directors, a newly-created office. His successor is to be chosen from the company's executive staff. The new arrangement will permit Mr. Ker to divide his responsibilities as the company's chief executive officer.

LORENZ IVERSEN, since 1925 vice-president of the Mesta Machine Co., Pittsburgh, has been elected president, succeeding the late H. F. Wahr. Mr. Iversen has been identified with the company for many years and, prior to his election as vice-president, served as chief engineer. L. W. MESTA has been elected vice-president. He was formerly assistant general superintendent, and has been identified with the Mesta organization since his graduation from the University of Pittsburgh in 1911. F. A. MESTA has been made a director of the company, filling the place on the board left vacant by Mr. Wahr's death.

J. H. REGAN, assistant secretary and assistant treasurer of the Pressed Steel Car Co., has left Chicago for a visit in Florida. He is recuperating from a recent illness.

A. M. CULLUM, who has been associated with the Reading Iron Co. for the past 10 years, has resigned his position as oil country sales manager and has become identified with the Harbison-Walker Refractories Co., Pittsburgh. R. W. THOMPSON has been appointed director of public relations of the Reading company, in addition to his duties as advertising manager, manager of cut nail sales and manager of sales for the Stoyestown Coal Mines, a subsidiary of the company. HAROLD S. BARD, of the New York office, has been made Chicago district representative, succeeding R. A. Griffin, who has resigned.

C. H. VOM BAUR sailed for Hamburg, Germany, Nov. 19, on his way to Moscow, Russia, for a period of two years, to act as chief engineer of the division of electric melting furnaces, both ferrous and non-ferrous, for the Soviet Government. He will be associated with the Union of Electrical Trusts or VEO. His address is Electroavod, Elektroavodskaja 21, Moscow, U.S.S.R.

P. N. GUTHRIE, JR., who has been vice-president in charge of sales of the Reading Iron Co., Reading, Pa., has been elected president. He received his early training in the employ of Park Brothers & Co., Pittsburgh, and later became identified with the management and operation of natural gas utilities. Returning to the iron and steel business, Mr.



P. N. Guthrie, Jr.

Guthrie served for several years as sales agent and general manager of sales for the Longmead Iron Co., Conshohocken, Pa. In 1909 he was placed in charge of sales for the South Chester Tube Co., Chester, Pa., and eight years later entered the Government service as assistant director, Bureau of Oil Well Supplies, returning to the Chester company at the end of the war. He served as manager of sales of the company until December, 1929, when he resigned to become vice-president in charge of sales of the Reading company.

JAMES B. ARMSTRONG, with office at 1 East Forty-second Street, New York, has been appointed district sales representative for the General Drop Forge Co. He also represents the Reading Steel Casting Co.

HOWARD MAYO, hydraulic engineer at the Rodney Hunt Machine Co., Orange, Mass., has become identified with the engineering department of S. Morgan Smith Co., York, Pa.

CARL E. JOHANSSON, inventor of the micrometer and the gages which bear his name, has been awarded the Cross of the Northern Star by King Gustav V of Sweden in recognition of his scientific achievements. The pres-

entation was made by Carl Berglund, Swedish vice-consul, at a dinner given in Mr. Johansson's honor in Detroit on Nov. 14 by the Swedish Engineers Society of Detroit. For some time Mr. Johansson has been associated with the Ford Motor Co., having invented many appliances now in daily use by the company.

ARNOLD LENZ, manager of the gray iron foundry of the Chevrolet Motor Co., Saginaw, Mich., was the speaker at the November meeting of the Quad-City Foundrymen's Association, at the Davenport, Iowa, chamber of commerce, on Nov. 17.

H. B. KILROE has been made representative of the Allied Die Casting Corp., Long Island City, N. Y., for the southern Ohio territory covering Dayton, Columbus and Indianapolis. He will have his headquarters at 507 Dayton Industries Building, Dayton.

BEN DAVIS, formerly superintendent of mines of the Edgewater-Kingston Coal Co., of W. Va., has been named general superintendent of mines of the Sloss-Sheffield Steel & Iron Co., Birmingham.

DR. ANCEL ST. JOHN, president, St. John X-Ray Service Corp., New York, will address the next meeting of the Steel Founders' Society of America at the Hotel Sherman, Chicago, on Dec. 11. He will give an illustrated lecture on the value of the X-ray in inspecting certain types of steel castings.

C. S. MCKINLEY, who recently resigned as Philadelphia district sales manager of the Republic Steel Corp., has become identified with the Philadelphia office of the Jones & Laughlin Steel Corp., and will be concerned chiefly with pipe sales.

DONALD B. PRENTICE, dean of Lafayette College and head of the department of mechanical engineering, has been appointed president of Rose Polytechnic Institute, Terre Haute, Ind. Professor Prentice will take up his new duties on Feb. 1, 1931.

J. B. JOHNSON, chief, metal branch, War Department, Wright Field, Dayton, Ohio, was awarded the Morehead medal at the thirty-first annual dinner of the International Acetylene Association, held Nov. 14 at the Congress Hotel, Chicago.

ARTHUR J. TUSCANY, manager, Gray Iron Institute, Cleveland, was the guest of the New England Foundrymen's Association at Providence, R. I., on Nov. 15. His address was confined almost exclusively to the workings of the institute.

HENRY FISCHBECK, chief metallurgist, Pratt & Whitney Aircraft Co., spoke on "Aircraft Material" at the monthly meeting of the New Haven chapter of the American Society for Steel Treating, at the University Club, Bridgeport, Conn., Nov. 20.

▲ ▲ ▲ OBITUARY ▲ ▲ ▲

E. S. WHEELER, Chicago district representative for the V & O Press Co., Hudson, N. Y., died suddenly in Chicago on Nov. 20, following an operation. He was 41 years of age.

WALTER JAMES TOWNE, chief engineer, Chicago & North Western Railway, died Nov. 24, aged 61 years. Mr. Towne received his schooling at Rensselaer Polytechnic Institute and gained his first experience in railroad work with the Santa Fe. He entered the service of the Chicago & North Western in 1899. In 1906 he was made engineer of maintenance of way and six years later became general superintendent of the road. His appointment as chief engineer came in 1920.

CHARLES T. LEFFLER, head of the Charles Leffler Machine Co., Brooklyn, died at his home there on Nov. 21. He had been in the machine business for 50 years.

DAVID EDWARD MILES, general manager of the Moline Iron Works, plant No. 3, Moline, Ill., died Nov. 4 of pleurisy of the heart. Mr. Miles was born in Moline Nov. 3, 1869. For 31 years he was foundry foreman of the Union Malleable Iron Co., East Moline, Ill., and 10 years ago accepted the position of general manager of plant No. 3 of the Moline Iron Works.

FRANK NEWTON WELLS, president, Beaton & Corbin Mfg. Co., Southington, Conn., died Nov. 13 at a Hartford hospital following a brief illness. Mr. Wells was born at Pipin, Wis., March 12, 1858. He was identified for 28 years with Humason & Beckley Mfg. Co., New Britain, Conn., and was interested in the company of which he was president from its organization. He succeeded his father as president in 1911.

KIRK TAYLOR, president, Management Magazines, Inc., Chicago, recently died at a sanitarium at Allentown, Pa., following an attack of pneumonia. Mr. Taylor was born in Detroit in 1889 and at one time was western manager for *Printers' Ink*.

A. WOLFF, president, A. Wolff Corp., dealer in old material, St. Louis, died at his home there Nov. 8, aged 66 years.

FRED A. LUNDAHL, since 1910 president of the Moline Pressed Steel Co., Moline, Ill., died on Nov. 14 following an operation. He was 47 years of age.

GEORGE E. PURPLE, president, Flexible Steel Lacing Co., died at La Grange, Ill., on Nov. 3, aged 66 years. When a young man he went to Chicago and occupied several positions

as a tool and machine designer. In 1907 he helped organize the company of which he was president.

JESSE A. COLBY, head of the firm of Colby & Christie, inspecting engineers, Philadelphia, died suddenly on a train bound for New York, Nov. 13, aged 60 years. He founded the company of which he was head in 1912, having been employed in the iron and steel industry since his boyhood.

JOHN LOVE, founder of Love Brothers, Inc., manufacturer of ornamental iron, and of the Aurora Foundry Co., both of Aurora, Ill., died Nov. 19, aged 77 years. Mr. Love and his brother, Joy, who died last January, were born in Aurora and more than 50 years ago started their first iron foundry in a shed near their home.

Rail and Lake Tariffs Are Suspended Until June

WASHINGTON, Nov. 25.—The Interstate Commerce Commission has suspended until June 20, 1931, tariff schedules proposing both increases and reductions in rates on iron and steel products from Central Freight Association territory to destinations in Michigan, Minnesota and Wisconsin by rail and Lake carriers. Suspension was ordered upon protest from steel manufacturers. Certain proposed reductions relate to local rates, while proposed increases are in joint and through rates. Illustrative of some of the schedules are those which increase to 33c. from 31c. per 100 lb., the through rate on wrought pipe from Youngstown to Duluth, Minn. Greater increases are proposed on some movements. Factors used from origin points to Cleveland were the old manufactured iron and steel rates in effect prior to the adjustment which went into effect throughout Official Classification territory as the result of the decision in the general iron and steel (Hoch-Smith resolution) rate case.

Foundrymen to Have Session on Pattern Making

Commencing with the 1931 convention of the American Foundrymen's Association, to be held in Chicago the week of May 4, the interest of those connected with the field of pattern production will be given more attention than in the past. In furtherance of this movement, a convention session is being planned at which papers dealing with various problems of the pattern-making branch of the foundry industry will be presented. There is also a possibility that a round table luncheon will be added to the program.

Machine Tool Buying Still at Low Ebb

November
Sales May Fall Below
Year's Low Point of October

WITH machine tool sales, as charted by the National Machine Tool Builders' Association, having reached the low point of the year in October, current reports from leading market centers point to the possibility that November may make even a poorer record, while the prospect for December is for no gain over this month's total.

Machine tool sales, at 90.1, dipped below the index figure 100 for the second time this year, the July average having been 91.1. The figure 100 is used to represent the average of

shipments in 1922, 1923 and 1924.

Following the decline to 91.1 in July, the index of sales rose to 113.8 in August and to 135.9 in September, giving rise to the belief that the slump in machine tool business had come to an end with July, but it is now conceded that the August-September rise was due largely to a considerable volume of business placed by the Amtorg Trading Corp., the buying representative of the Soviet government.

The machine tool trade lacks signs of immediate improvement. The pres-

ent disposition among prospective buyers is to postpone taking action until after Jan. 1. It is clear that many are watching the general business situation closely, as well as the status of their own order books, and will not add to their commitments unless it is absolutely necessary. The approach of the annual inventory period also acts as a deterrent.

There is an expectation that business for the machine tool trade will improve in January, but there are no convincing signs of such a recovery yet.

New York

The machine tool trade in the New York district has experienced another dull week. Purchases are at a minimum. Inquiries also are light. The machinery trade has a good many tentative prospects that have been hanging fire for some months, but in most instances the prospective buyers continue to postpone making commitments. It is not considered likely that the situation will change much, if any, until the early part of the new year.

Chicago

Some slight improvement in the local market is evidenced by the quickening in inquiries for individual machines. These are broadly scattered and many buyers give evidence of being near the point of making purchases. New sales, however, still are in small volume. An agricultural machinery manufacturer is said to have prepared a list which has not yet been made public. A Chicago steel mill, which has extensive plans for reequipping old shops, is requesting prices on three machine tools and states that purchases against new and old inquiries will not be made until after the first of the year. The trade is still waiting for a list from the Chicago Board of Education for the Lane school and readvertisement for 18 lathes for the Austin school.

Used equipment is moving faster. Machines are more numerous although few first-class used tools are to be found.

New England

Machine tool dealers and manufacturers are negotiating with a fairly large number of users, but the latter apparently have no intention of buying until the business situation clears. Local dealers, who anticipated there would be some sales late this year with January datings, have abandoned that idea. The used tool market is inactive and business among leading houses is confined mostly to reconditioning tools picked up from shops that are culling their equipment with the idea of cutting down overhead.

Milwaukee

Reports from the machine tool industry are more encouraging. Foundry and machine shop business is becoming more active and there is a feeling that the tide has turned. No marked increase in sales is expected for the remainder of the year although the character of current inquiry indicates early 1931 activity. Purchases for immediate delivery rarely go beyond a single item and apparently all orders are for quick replacement needs. The past week has developed more than the average of new plant establishments and expansion in this locality.

Cincinnati

New bookings of machine tools consist of a few single orders for standard types. Plants continue to operate on short time in keeping with

the slowness of demand. Inquiry reflects the sustained interest of users in new equipment, but no action has been taken on quotations.

Cleveland

With machine tool orders scarce, the trade is looking forward to January, when some revival in sales is expected. While some replacement business is in prospect, this probably will not be placed until next year. Sales the past week were limited to a few single machines and the volume of business was as light as in any recent week. Little new inquiry came out. The coming month does not look promising, as December is usually dull in the machinery trade.

Pittsburgh

Machine tool sales this month will probably fall under any corresponding period of 1930 and prospects for December are no better. Nevertheless, local companies are busy working on estimates for budgeting purposes and although much of the work under consideration is extremely indefinite, the outlook for 1931 is not unfavorable. Current inquiry is light and in general involves small totals.

Renewed buying by the railroads is indicated by the inquiry of the Norfolk & Western. While Pittsburgh dealers are not actively figuring on this, it is being watched with considerable interest and other roads which have car-building programs planned for their own shops may be expected to come into the market also.

New York

BIDS will soon be asked by Department of Hospitals, Municipal Building, New York, for power plant at Harlem Hospital, West 137th Street, to cost over \$250,000 with equipment. Sloan & Robertson, 420 Lexington Avenue, are architects.

O'Brien Brothers Shipyard Corp., Port Richmond, S. I., has work under way on a new drydock, 75 ft. wide and 216 ft. long, for handling vessels up to 2000 tons and will provide additional construction and repair facilities.

William I. Hohauser, Inc., 17 West Forty-fourth Street, New York, architect and engineer, has plans for a multi-story industrial and terminal building in Brooklyn, to cost over \$350,000 with equipment.

Department of Mental Hygiene, State Office Building, Albany, N. Y., is planning an industrial building at proposed new institution for defective delinquents at Napanoch, N. Y., entire project to cost \$250,000, including storage unit.

James J. Millman, Inc., 67 Court Street, Brooklyn, architect, has plans for a multi-story automobile service, repair and garage building to cost about \$100,000 including equipment.

Board of Education, Park Avenue and Fifty-ninth Street, New York, plans installation of manual training equipment in three new multi-story high schools, Franklin K. Lane school, Brooklyn-Queens border line; Woodrow Wilson school in Queens; and Lafayette school in Gravesend district, Brooklyn, each to cost about \$3,000,000. Walter C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect for board.

Board of Transportation, 250 Hudson

Street, New York, J. H. Delaney, chairman, is asking bids until Dec. 5 for a service and repair building and inspection shed for subway cars, at Concourse Yard.

William Shary, 22 East Seventeenth Street, New York, architect, has plans for a three-story automobile service, repair and garage building, 200 x 225 ft., to cost over \$150,000 with equipment.

Sensitive Research Instrument Corp., 142 East Thirty-second Street, New York, manufacturer of precision instruments, parts, etc., has purchased property, 60 x 140 ft., on Bronx Boulevard, as site for new one-story plant, to cost about \$40,000 with equipment.

Public Service Co-Ordinated Transportation Co., Public Service Terminal, Newark, N. J., has awarded general contract to Shore Construction Co., 94 Christie Street, for one-story motor bus service, repair and garage building, 100 x 170 ft. at Plainfield, N. J., to cost about \$100,000 with equipment.

County Gas Co., Atlantic Highlands, N. J., has plans for a two-story equipment storage, service and repair building, to cost about \$35,000 with equipment.

Officials of Watson-Flagg Engineering Co., 107 Nineteenth Avenue, Paterson, N. J., manufacturer of mechanical equipment, have organized Watson-Flagg Machine Co., with capital of \$250,000, to operate a general machine and equipment works. John L. and John H. Flagg head new organization.

National Aircraft & Airways Co., Paterson, N. J., has leased Rumler mill property on Thirteenth Street for new plant for manufacture of airplane equipment, parts and accessories.

Pathe Exchange, Inc., Bound Brook, N. J., has awarded general contract to

M. C. Fredennick & Sons, Inc., 25 West Forty-fifth Street, New York, for one-story factory, 40 x 180 ft., to cost close to \$65,000 with equipment.

Handy Rule Tool Co., Inc., Newark, N. J., care of Lionel P. Kristeller, 810 Broad Street, attorney, recently organized with capital of \$100,000, plans operation of local factory for production of hand tools and mechanical specialties.

Wilbur D. Houston, 119 Webster Avenue, Roselle Park, N. J., and associates have organized Modern Products Corp., with capital of \$100,000, to operate local plant for manufacture of machinery and parts. John M. Young, Elkins Park, Pa., will be an official of new company.

Headquarters of General Bronze Corp., Long Island City, recently mentioned as having plans for new works, is at Chicago and not Pittsburgh, as erroneously stated.

New England

SITE at Malden, Mass., has been purchased by Edward J. Lamothe Co., 25 Chestnut Street, Somerville, Mass., manufacturer of galvanized ware, etc., for new one-story plant, totaling about 15,000 sq. ft. floor space, to cost over \$40,000 with equipment.

New England Power Association, 89 Broad Street, Boston, operating electric light and power properties, is disposing of a note issue to total \$20,000,000, part of fund to be used for extensions and improvements in plants and system.

Rock of Ages Corp., Barre, Vt., operating granite properties, has plans for a one-story stone-cutting and finishing plant, 65 x 250 ft., to cost about \$70,000

INDUSTRIAL ACTIVITY

Prospects Revealed by a Survey of Construction Projects

NEW construction requiring machinery and equipment reached a total in the past week of \$38,000,000, in addition to which bond and note issues by public utilities and municipalities total \$4,000,000. New construction compares with \$18,600,000 a week ago. A comparison of total projected expenditures this month with October shows a considerable broadening in improvements and new building, as follows:

	Total	Weekly Average
September	\$89,250,000	\$22,312,500
October	128,350,000	26,000,000
November	348,000,000	87,000,000

Of this week's \$38,000,000 total, about \$21,000,000 is in municipal projects for power plants, water service improvements and airports, one power development on the Blue Williams River, California, by the Metropolitan Water District of Southern California calling for \$18,000,000. Industrial projects are \$5,000,000, of which \$500,000 is in metal-working plants, while oil and natural gas company improvements require \$2,500,000 and public utility improvements about \$9,000,000.

Oil and natural gas projects include oil refineries and storage plants in Pueblo, Colo.; Douglas, Wyo.; Crafton, Pa., and Detroit. Natural gas expansion calls for a \$2,000,000 line from the Texas Panhandle to Omaha, for the Western Natural Gas Corp., and a \$500,000 line from Big Lake oil fields to San Angelo, Tex., for the Oklahoma Natural Gas Corp.

Among the important industrial projects are a \$200,000 lime products plant at Antelope, Cal., a \$300,000 ice manufacturing plant in Chicago, a \$350,000 terminal building in Brooklyn, and a \$400,000 factory for typewriter supplies at Cambridge, Mass. Railroad expenditures include an \$800,000 market in New Orleans by the Southern Pacific and a \$350,000 coal transshipment plant at Baden, Pa., for the Pennsylvania Railroad.

Vocational school construction reaches close to \$4,500,000, compared with \$2,000,000 a week ago and \$3,000,000 two weeks ago, including groups in Santa Barbara, Cal.; New York, Oakland Village, Ohio, and Missoula, Mont.

with equipment. L. F. Caproni & Co., 1044 Chapel Street, New Haven, Conn., are architects.

Jonathan Grout, Fairfield, Conn., and associates have organized Hinkler Aircraft, Inc., Bridgeport, Conn., with capital of \$50,000, to operate plant in Bridgeport for production of airplanes and parts. Bradford Boardman, Fairfield, is interested in new company.

New England Telephone & Telegraph Co., 50 Oliver Street, Boston, has plans for a new factory at Watertown, Mass., to be occupied under lease by Western Electric Co., 195 Broadway, New York, an affiliated organization, to cost over \$100,000 with equipment. Part of unit will be used for storage and distribution. Monks & Johnson, 99 Chauncy Street, Boston, are architects and engineers.

Green Mountain Power Co., Montpelier, Vt., has disposed of a note issue of \$1,500,000, part of proceeds to be used for extensions and improvements. Company is a subsidiary of People's Light & Power Corp., 27 William Street, New York.

F. S. Webster Co., 340 Congress Street, Boston, manufacturer of typewriter equipment and supplies, has superstructure under way for a new multi-story plant at Cambridge, Mass., to cost over \$400,000 with equipment.

Swett & Sibley, Inc., 148 Sidney Street, Cambridge, Mass., manufacturer of ornamental iron and wire products, plan rebuilding part of plant recently destroyed by fire, with loss over \$40,000, including equipment.

John J. Beaton & Son, Wareham, Mass., have incorporated as Wareham Mfg. Co., Inc., manufacturer of horse-shoes. After installation of new machines operations will start about Dec. 1. Mills and factory at South Wareham were formerly property of Standard Horse Shoe Co.

Atlantic Gypsum Products Co., Portsmouth, N. H., has plans for new works to replace structure recently destroyed by fire. Miscellaneous equipment will be purchased.

Leroy F. Gould, Western Avenue, Framingham, Mass., will soon take bids on an airport hangar and contemplates installing a small machine shop early in 1931.

Four electrically driven 30,000-g.p.m. centrifugal pumps, motors, switchboard, valves, sluice gates and other appurtenances are required by city of Hartford, Conn., for a new pumping station, bids for which close Dec. 9.

Philadelphia

CONTRACT has been let by Philadelphia Electric Co., Tenth and Chestnut Streets, Philadelphia, to Cruse-Kemper Co., Ambler, Pa., for water-gas storage and distributing plant at West Conshohocken, Pa., to cost \$800,000.

Aramingo Welding Co., Philadelphia, has been organized to take over and expand company of same name with works on Unity Avenue. J. Kyle Dudley and B. I. Gamble head new company.

Corrugated Container Co., Trenton Avenue and Venango Street, Philadelphia, has awarded a general contract to H. A. Hopple, Heed Building, for a one-story addition and improvements in present plant.

Penn Card & Paper Co., 20 North Sixth Street, Philadelphia, has purchased five-story building at 410-16 Race Street for new plant for increased production.

E. I. du Pont de Nemours & Co., du Pont Building, Wilmington, Del., is planning expansion and improvements at industrial chemical manufacturing plant at Mineral Springs, Ala., to cost about \$200,000 with equipment.

City Commission, Harrisburg, Pa., has plans for a one-story pipe and meter shop, 30 x 124 ft., with pipe fitting and other departments.

Automatic Rake Co., Jersey Shore, Pa., recently organized with capital of \$20,000 to manufacture lawn, garden and hay rakes, plans operation of local factory. Jesse R. Ford, Jersey Shore, and Paul J. Ford, Westfield, Pa., are heads.

Duplex Brake Engineering Co., 54 Garfield Avenue, Trenton, N. J., manufacturer of hydraulic automobile brakes, is planning removal to another location in city for increase in present capacity. Frederick J. Mackenzie is president.

New Jersey Bell Telephone Co., Telephone Building, Newark, N. J., has awarded a general contract to Harrison & Fisher, 242 Cuyler Avenue, Trenton, N. J., for automobile service, repair and garage building at Trenton, to cost about \$100,000 with equipment.

South Atlantic

BOND issue of \$2,500,000 has been approved by citizens of Baltimore for a municipal airport, including hangars, repair shop, administration building and other units for airplane and seaplane service. Department of Public Works will be in charge.

Lloyd E. Mitchell, Inc., 915 East Monument Street, Baltimore, plumbing and heating equipment, is considering plans for a two-story machine shop, 55 x 140 ft., to cost over \$30,000 with equipment. Henry G. Perring, Court Square Building, is architect and engineer.

E. A. Clore & Son, Madison, Va., have plans for rebuilding furniture manufacturing plant recently destroyed by fire, to be two stories, 84 x 85 ft., to cost about \$35,000. Equipment will include automatic and hand-operated lathes, electric hand drills, motor-driven mortiser, electric bench saw, surfacer and other tools.

Bureau of Yards and Docks, Navy Department, Washington, is asking bids until Dec. 17 for a one-story metal aircraft shop at naval operating base, San Diego, Cal., to cost about \$130,000; until Dec. 3 for a shell house and magazine at naval ammunition depot, Lake Denmark, N. J., to cost \$55,000; until Dec. 24 for a 2000-kw. turbo-alternator for Mare Island, Cal., and until Dec. 3 for steel tank, pumping machine and auxiliary equipment for fuel depot at Hampton Roads, Norfolk, Va.

Edgar Brothers Co., McIntyre, Ga., has plans for a new clay-mining and refining plant at Gardner, Ga., to cost over \$150,000.

Kingrea Brothers, 38 Monroe Street, Narrows, Va., are organizing a company to establish a flour mill on local site to cost over \$100,000. A blending plant is also being considered.

Louis Blaustein, president, American Oil Co., American Building, Baltimore, and associates have acquired plants and properties of Crown Central Petroleum Corp., operating in Oklahoma oilfields, including oil-producing, refining and storage and distributing plants, and pipe line systems. Plans are under way for expansion and improvements. Mr. Blaustein will be chairman of board of Crown

company, with W. A. Williams, president of company continuing in that capacity.

Battery Machinery Co., Rome, Ga., is considering installation of additional tools, including a 30-in. lathe.

Commonwealth Marble & Granite Co., Candler Building, Atlanta, Ga., B. F. Coggins, head, has awarded general contract to Converse Bridge & Steel Co., Anderson Street, Chattanooga, Tenn., for rebuilding part of plant recently destroyed by fire, with loss close to \$125,000 with equipment.

Chatham County Board of Education, Savannah, Ga., plans installation of manual training equipment in new three-story junior high school to cost about \$200,000, for which bids will soon be asked on general contract. Levy & Clarke, Blum Building, are architects; Cletus Bergen, Liberty Bank & Trust Building, is consulting architect.

Buffalo

CONTRACT has been let by Flexlume Corp., 1100 Military Road, Buffalo, manufacturer of electric signs and displays, to Elliott Construction Co., Pioneer Trust Building, Kansas City, Mo., for one-story and basement plant, 100 x 160 ft., at North Kansas City, to cost about \$65,000 with equipment. Keene & Simpson, Land Bank Building, Kansas City, are architects.

Houdaille-Hershey Corp., operating Houde Engineering Corp., 537 East Delavan Avenue, Buffalo, manufacturer of shock absorbers, has acquired Muskegon Motor Specialties Co., Muskegon, Mich., and its associated organization, Jackson Motor Shaft Co., Jackson, Mich., manufacturers of crankshafts, camshafts and other automobile equipment. Operations will be continued at present locations.

Department of Correction, State Office Building, Albany, N. Y., has plans for shops and mechanical units, including maintenance storehouse, etc., at State prison at Attica, N. Y., in connection with group of structures to cost over \$2,000,000. State Department of Architecture, address noted, in charge.

Leonard L. Bouchard, 532 St. Jacob Street, Rochester, N. Y., and associates have organized Automotive Safety, Inc., with capital of \$20,000, and plan operation of local factory for production of automobile safety equipment and devices. Thomas A. Bouchard, Shelbourne Road, South Burlington, Vt., will be an official of new company.

Pittsburgh

PLANS are under way by Pennsylvania Railroad Co., Pittsburgh, for new river-rail coal transshipment plant at Baden, with storage and distributing facilities, including elevating, conveying and other equipment, to cost \$350,000. Company engineering department at Pittsburgh, W. D. Wiggins, chief engineer, is in charge.

United States Engineer Office, Pittsburgh, is asking bids until Dec. 19 for a hydroelectric power plant for Lock No. 8, Allegheny River, specifications on file.

Armour & Co., Oil City, Pa., meat packers, plan rebuilding local branch and distributing plant recently destroyed by fire, with loss of about \$50,000, including equipment.

Allegheny Gas Co., Smethport, Pa., operating natural gas properties, is plan-

ning extensions in pipe lines in several counties to cost over \$100,000.

Robert M. Gordon, Carnegie, Pa., and associates have organized R. M. Gordon & Co., to operate plant in Pittsburgh district for manufacture of machinery and parts. John L. Baillie, 250 Barr Avenue, Crafton, Pa., is treasurer.

Gulf Refining Co., Frick Annex, Pittsburgh, has begun erection of new oil storage and distributing plant, including garage unit for company motor trucks and cars, to cost over \$80,000 with equipment.

Quality Glass Co., Van Vorhis, W. Va., recently organized, will establish a local mill for production of flint glass products, including electrical glass products and pressed ware. Walter Clulo is president, general manager and purchasing agent.

St. Louis

CONTRACT has been let by Century Electric Co., 1806 Pine Street, St. Louis, manufacturer of electric motors and kindred equipment, to Superior Structural Steel Co., 5100 Farlin Street, for steel framing for an addition, to cost over \$40,000 with equipment.

City Council, Hominy, Okla., is arranging for a bond issue of \$150,000 for a municipal electric light and power station, and extensions and improvements in municipal waterworks. V. V. Long & Co., Colcord Building, Oklahoma City, Okla., are engineers.

Phillips Petroleum Co., Bartlesville, Okla., has acquired about 30,000 acres of oil lands, with options on 75,000 acres additional near Douglas and Lance Creek oilfields, Wyoming. Company will make tests on property and contemplates a new oil storage and distributing plant to cost over \$100,000, with refinery at later date to cost more than \$400,000.

City Council, City Hall, Oklahoma City, Okla., is considering a municipal automobile repair, service and garage building for city-owned cars and motor trucks to cost over \$200,000 with equipment. It is proposed to arrange bond issue.

City Council, Concordia, Kan., has work under way on a one-story hangar unit, 80 x 120 ft., at municipal airport, with repair facilities, to cost over \$35,000.

Grand Hydro Electric Co., Sixth and Peoria Streets, Tulsa, Okla., is planning erection of hydroelectric generating plant on Grand River, near Pryor, Okla., consisting of four power dams, with main hydroelectric generating station, to cost more than \$15,000,000 with transmission system.

Union Transportation Co., Fourth and Cheyenne Streets, Tulsa, Okla., J. A. Frates, president, has asked bids on general contract for a one-story and basement automobile service, repair and garage building, 128 x 250 ft., for motor buses, to cost about \$100,000 with equipment. Joseph Stone, 1624 North Lewis Street, is architect.

City Council, Fayetteville, Ark., plans establishment of municipal airport on 170-acre tract, with hangars, repair shop and other field units, to cost more than \$75,000 with equipment.

Common Council, Mangum, Okla., plans installation of 200,000-gal. elevated steel tank, with pumping machinery and auxiliary equipment for municipal waterworks. H. T. Lawrence is engineer.

Chicago

OPERATION of a local factory is planned by Jenkins Mfg. Co., Chicago, care of Industrial Development Co., 3912 North Central Park Avenue, recently organized with capital of \$52,500 for manufacture of electrical appliances and equipment. Company is headed by Charles H. Lenske and A. W. Zitzman.

Jones Coal Co., Marissa, Ill., is planning rebuilding of portion of tippie at its Eureka mine No. 1, recently destroyed by fire with loss close to \$25,000 including equipment.

Link Belt Supply Co., 418 South Third Street, Minneapolis, has plans for a two-story machine shop addition, 56 x 90 ft., to cost about \$25,000.

Board of Trustees, Iowa State Teachers' College, Cedar Falls, Iowa, has plans for a power house, 55 x 135 ft., to cost over \$100,000 with equipment. E. E. Cole, Cedar Falls, is architect.

Board of Education, Missoula High School District, Missoula, Mont., is planning installation of manual training equipment in three-story high school addition to cost about \$200,000, for which general contract recently was let to John E. Hightower, 827 Locust Street. C. J. Forbis, Montana Building, is architect. Superstructure has been placed under way.

People's Fuel & Supply Co., 4921 South Racine Avenue, Chicago, a subsidiary of Borden Farm Products Co., 326 West Madison Street, is planning new two and three-story ice-manufacturing, storage and distributing plant, to cost over \$300,000 with machinery.

Rocky Mountain Refinery, Inc., 1633 East Sixth Street, Pueblo, Colo., A. N. Bobbitt, vice-president, has plans for immediate erection of first unit of new oil refinery, to cost about \$100,000 with machinery.

Detroit

WORK has been started by Firestone Tire & Rubber Co., Akron, Ohio, on four-story and basement storage, distributing and service plant at Detroit, to cost over \$175,000 with equipment. General contract was let recently to Otto Schuch Co., 159 East Columbia Street, Detroit. Company engineering department is in charge.

Board of Wayne County Road Commissioners, Court House, Detroit, has awarded general contract to Banbrook-Gowan Co., Brewster Street, for one-story machine and repair shop, to cost about \$40,000 with equipment. Giffels & Vallet, Marquette Building, are architects and engineers.

Graham-Paige Motors Corp., 5840 Woodward Avenue, Detroit, manufacturer of automobiles, is remodeling and improving former mill at Wayne, Mich., for a sheet-metal finishing department, to cost over \$50,000 with machinery. Company will concentrate such line of output at Wayne in future, with transfer of wood-working tools and machinery to branch plant at Evansville.

Valvoline Oil Co., 2248 West Warren Avenue, Detroit, is considering a new local storage and distributing plant, to cost about \$75,000 with equipment. Headquarters are in Chrysler Building, New York.

Verde Antique Marble Co., Ishpeming, Mich., recently organized, has leased properties near city for early operation of quarrying and cutting plant, with in-

stallation of elevating, conveying and other equipment. Charles S. Shepherd is secretary and treasurer.

Board of Works, St. Joseph, Mich., is planning installation of an electric-operated pumping plant for municipal waterworks, to cost about \$160,000 with machinery.

City Council, Wyandotte, Mich., has authorized a municipal electric light and power plant, to cost close to \$300,000 with equipment.

Stafford-Johnson Co., Ionia, Mich., recently organized with capital of \$100,000, has taken over former factory of Stafford Co. and will establish plant for manufacture of school, theater and church furniture. Thad B. Preston, Ionia, is president, and Albin Johnson, Belding, secretary and treasurer.

Cincinnati

PLANs are under way by Colonial Stages, Inc., 2123 Highland Avenue, Norwood, Cincinnati, for a two-story motor bus service, repair and garage building, 127 x 290 ft., to cost over \$175,000 with equipment. James E. Branson, Union Trust Building, is mechanical engineer.

Department of Public Welfare, Columbus, Ohio, has awarded general contract to Westerman Construction Co., 247 East Broad Street, for two-story and part basement power plant at Longview State Hospital, Cincinnati, to cost about \$275,000 with equipment. T. Ralph Ridley, Columbus, is architect.

Central Ohio Light & Power Co., Findlay, Ohio, is disposing of a bond issue of \$3,600,000, part of fund to be used for extensions and improvements in power plants and system, and acquisition of other utilities.

Board of Education, Oakland Village, Ohio, is considering installation of manual training equipment in new two-story and basement junior high school to cost about \$360,000, for which bonds have been approved. Schenck & Williams, Third National Bank Building, Dayton, Ohio, are architects.

Tennessee Coach Co., 428 State Street, Knoxville, Tenn., operating a motor bus system, is planning one-story automobile service, repair and garage building, to cost close to \$85,000 with equipment.

Tennessee Cereal Co., Independent Life Building, Nashville, Tenn., has awarded general contract to Wagar Construction Co., Atlanta, Ga., for a four-story mill, 50 x 195 ft., with one-story power house adjoining, 45 x 50 ft., to cost over \$125,000 with equipment. Hart & Stone, Hitchcock Building, are architects.

R. C. Craven, head of Conner-Craven Equipment Co., Chattanooga, Tenn., industrial and construction equipment, and associates have organized Mark-Rite Co. to operate a local plant for manufacture of metal road markers and will begin production at once. Marker units are made of bronze and alloy metals.

Cleveland

ARRANGEMENTS are under way for merger of American Multigraph Co., 1814 East Fortieth Street, Cleveland, manufacturer of printing and duplicating machinery and parts, and Addressograph Co., 901 West Van Buren Street, Chicago, manufacturer of addressing machines. New company will be known as Addresso-

graph-Multigraph Co., and will arrange for a stock issue of about 760,000 shares, part of proceeds to be used for consolidation and expansion. Both plants will be continued as heretofore. Frank H. Woods, chairman, Addressograph Co., will be chairman of board of consolidated company; H. C. Osborn, president, Multigraph Co., will be chairman of executive committee; and J. E. Rogers, president, Addressograph Co., president of new organization.

Canton Ice & Fuel Co., 1210 Third Street, N. E., Canton, Ohio, will take bids early in December for a two-story and basement addition to ice-manufacturing plant, to cost close to \$60,000 including equipment.

Oak Harbor Glass Co., Oak Harbor, Ohio, manufacturer of automobile glass, sheet glass specialties, etc., has taken over Berger Building at Fremont, Ohio, for larger plant and will remove to new location.

Titus Auto Parts Co., Zanesville, Ohio, care of Meyer & Crossan, Peoples' Savings Bank Building, attorneys, recently organized by C. B. Titus, Zanesville, and associates with capital of \$50,000, will operate plant for manufacture of automobile parts and kindred mechanical specialties. Arthur C. Nicholas, Zanesville, is interested in new company.

Packard Electric Co., Warren, Ohio, manufacturer of cables, radio wire products, etc., will establish branch plant at Toronto, Ont., for production of automotive wire.

Lima Armature Works, Lima, Ohio, plans rebuilding part of plant recently destroyed by fire, with loss about \$35,000 including equipment.

Milwaukee

CONSTRUCTION of a \$75,000 plant addition will be started Dec. 1 by Modine Mfg. Co., 1700 Racine Street, Racine, Wis. It will be 40 x 80 ft., four stories and basement, devoted mainly to production of unit heaters for large area structures. Company also manufactures radiators for automobile, motor truck, tractor and industrial gas engines.

Advance Machine Works, Madison, Wis., a new organization of local and Chicago capital, is establishing shop at 319-321 East Wilson Street to manufacture automatic pumps designed by William B. Baldwin, Madison, for farms, homes and other needs for running water under pressure. Pump is suitable for both deep and shallow wells.

J. C. Halmerl and F. F. Koehler, formerly associated with Glancy Malleables Corp., Waukesha, Wis., have leased Chicago & North Western Railway roundhouse at Baraboo, Wis., and are installing equipment for production of gray iron and aluminum castings on a jobbing basis. Railroad retains six stalls of roundhouse for own needs. New foundry will commence operations Dec. 1.

Modern Pouring Devices Co., Port Washington, Wis., is planning shop addition costing about \$25,000. Corporate title has been changed to Modern Equipment Co. to better describe its activities, now extending outside of foundry industry.

LaCrosse Refrigerator Co., LaCrosse, Wis., manufacturer of steel ice boxes and automatic refrigerator cabinets, is building shop extension, 60 x 82 ft., and has purchased one 78,000-lb. and one 35,000-lb. press for production of shaped steel parts, heretofore supplied by outside

companies. Improvements will cost about \$45,000.

Milwaukee Flush Valve Co., 125 Reservoir Avenue, Milwaukee, is awarding contracts for shop addition, 30 x 40 ft., costing about \$25,000 with equipment.

Jensen Machine Works, Sawyer, Wis., contemplates enlargement of plant following acquisition of manufacturing rights on new type of mechanical stoker designed by Joseph Wasserdolich, until recently a member of machine shop and foundry company at Algoma, Wis.

Indiana

WORK will soon begin by Fluck Cut Stone Co., Inc., 1235 East Seventy-fourth Street, Chicago, on stone-cutting and finishing plant, 50 x 150 ft., near Bloomington, Ind., to cost over \$35,000 with equipment. Mechanical-handling equipment will be installed. Abell-Howe Co., 20 North Wacker Drive, Chicago, is engineer.

Officials of Universal Brass Works, Inc., 139 South East Street, Indianapolis, have organized American Bronze Corp., as an affiliated interest to operate a local foundry for production of bronze specialties. Universal Brass Works has been reorganized with capital of \$15,000. Edwin S. Harter and C. M. Carleton head companies.

State Line Generating Co., 72 West Adams Street, Chicago, has begun work on expansion program at steam-operated electric generating plant at Hammond, Ind., to cost over \$20,000,000 with equipment. Sargent & Lundy, 20 North Wacker Drive, Chicago, are mechanical engineers.

Coca-Cola Bottling Co., Washington, Ind., has awarded general contract to Kretz & Zinkan, local, for two-story bottling, storage and distributing plant, 50 x 100 ft., with installation of automatic bottling, sealing and other equipment, to cost about \$55,000. Benjamin Clawson, 503 Pearl Street, is architect.

Gulf States

CONTRACT has been let by Tooke & Reynolds Co., Arcadia, La., to Tudor & Radcliff, Alexandria, La., for power plant at Pineville, La., for central station service, to cost \$180,000 with machinery. Power distributing system will be built.

Orleans Levee Board, New Orleans, is planning a municipal airport on Lake Pontchartrain, with hangars, repair shop, oil storage and other field units, to cost close to \$1,000,000. John Klorer is chief engineer.

Florida Power Corp., St. Petersburg, Fla., has purchased Gulf Utilities Co., operating electric light and power properties at New Port Richey and Elfers, Fla. Expansion and improvements are planned at New Port Richey, including transmission lines.

Oklahoma Natural Gas Corp., San Angelo, Tex., plans a pipe line from Big Lake Oilfield district to San Angelo and vicinity, about 125 miles, to cost over \$500,000. Gas will be secured from properties of Big Lake Oil Co., an interest of Texon Oil & Land Co.

Southern Pacific Co., Dallas, Tex., is planning a fruit and vegetable terminal for freight handling at New Orleans, with cold and dry storage facilities, to cost over \$800,000 with equipment. Com-

pany engineering department is in charge.

Louisiana Public Utilities Co., Lafayette, La., is considering a one-story ice-manufacturing plant at Crowley, La., to cost about \$55,000 with machinery.

Canulette Shipbuilding Co., Sildell, La., has begun one-story addition, 40 x 140 ft., for steel fabricating shop, to cost over \$50,000 with equipment.

B. F. Goodrich Co., Akron, Ohio, manufacturer of automobile tires and tubes, etc., contemplates a new factory branch and distributing plant at Miami, Fla., to cost over \$150,000 with equipment.

Baton Rouge Electric Co., Baton Rouge, La., has awarded general contract to A. C. Stewart, 810 East Boulevard, for two-story equipment storage and distributing plant, 85 x 110 ft., with repair and garage facilities, to cost about \$90,000 with equipment.

Mississippi Clay Co., Charleston, Miss., recently organized with capital of \$3,000,000, plans development of local properties, including installation of mining and mechanical-handling equipment. It is proposed to operate a plant for production of clay wares later, entire project to cost over \$200,000. Ned R. Price and J. W. Saunders, both of Charleston, are heads.

Western Natural Gas Corp., Public Utility Investment Building, Salina, Kan., is contemplating natural gas pipe line from Panhandle field, Tex., to Omaha, Neb., to cost over \$2,000,000.

Lone Star Cement Co., Dallas, Tex., is planning expansion and improvements at Houston mill, including modernizing of considerable equipment and installation of new machinery, to cost over \$75,000. Company is completing a similar program at Dallas mill.

Pacific Coast

A BUDGET of \$23,000,000 is being arranged by Southern California Edison Co., Los Angeles, for extensions and improvements in power plants and system during 1931, including addition to steam-operated electric generating plant at Long Beach, to cost \$8,620,000; extensions in hydroelectric power facilities in Big Creek district, Fresno County; additions in transmission lines and power substations. Company engineering department will be in charge.

Metropolitan Water District of Southern California, 222 South Hill Street, Los Angeles, has applied for permission to construct a hydroelectric power plant on Colorado River in California and Arizona, with power dam near mouth of Blue Williams River, to cost over \$18,000,000, with transmission system.

Italian-American Motors Co., Inc., 604 Montgomery Street, San Francisco, will proceed with erection of new plant at Sausalito, Cal., for parts production and assembling of gasoline motors, to cost close to \$30,000 with equipment. McFarland & Moore, 126 Otis Street, San Francisco, are architects.

Board of Education, Santa Barbara, Cal., is planning a vocational shop unit at proposed new high school group, to cost about \$650,000, for which bids will be asked on general contract in December. W. H. Weeks, 111 Sutter Street, San Francisco, is architect.

Arizona Edison Co., Phoenix, Ariz., is disposing of a note issue of \$1,500,000, part of proceeds to be used for expansion and improvements, including steel tower

transmission line in Hidden Valley section.

California Lime & Products Co., care of Richard L. Hollingsworth, secretary of Arcade Sand Co., Lincoln, Cal., recently organized by Mr. Hollingsworth and associates, has acquired property about five miles from Antelope, Cal., and is considering new lime and lime products plant to cost over \$200,000 with machinery. Project will include a machine shop and power house. Company has also secured raw material properties near Colfax, Cal., and will install a mining plant. Bayliss C. Clark, Sacramento, Cal., formerly city engineer, will be head of new organization.

Tucson Gas, Electric Light & Power Co., Tucson, Ariz., has authorized an addition to steam-operated electric power plant, including installation of new Diesel engine unit and auxiliary equipment, to cost over \$90,000. Samuel Headman is in charge.

Pacific Gas & Electric Co., 445 Sutter Street, San Francisco, has applied for permission to erect group of hydroelectric power plants on North and South Forks of Battle Creek, Shasta and Tehamas counties, to cost over \$5,000,000 with steel tower transmission line.

Canada

TOWN Council, Mont Laurier, Que., contemplates improvements to power plant and system to cost \$260,000. S. Ouimet, 706 St. Gabriel Street, Montreal, is engineer.

Bids will be called at once by Albert Kahn, architect, Marquette Building, Detroit, for a four-story power plant, 66 x 73 ft., at London, Ont., for Kellogg Co. of Canada, Ltd.

J. R. Carson, 57 Front Street, Orillia, Ont., has been awarded general contract for a one-story factory, 70 x 260 ft., at Gravenhurst, Ont., for Rainbow Craft Co., care of D. S. Terry & Co., C. P. R. Building, Toronto, to cost \$35,000. Equipment will be purchased.

Willys-Overland, Ltd., Weston Road, Toronto, will build an addition, 35 x 190 ft., to cost \$12,000.

Sawmill at Port Haney, B. C., owned by Martyn Lumber Co., Ltd., recently destroyed by fire, will be rebuilt early next year. New mill will be two stories, 40 x 120 ft., for which equipment will be purchased.

Bessemer Tile & Pipe Co., Ltd., Buffalo, has acquired a five-acre site at Calgary, Alta., and will start work during winter on erection of a plant. Company manufactures cast iron pipe, pipe fittings and water pipe up to 6 in.

Manitoba Rolling Mills Co., Ltd., Winnipeg, is contemplating enlargements, to cost \$100,000, including new department for rerolling rails into reinforcing steel and industrial rails.

Foreign

PLANS are under way by Ford Motor Co., Dearborn, Mich., for additions to assembling plant at Mexico City, Mexico, to cost close to \$1,000,000.

Compagnie des Phosphates de Constantine, Paris, France, has plans for new phosphate plant at Kouif, Algeria, to cost over \$600,000 with equipment. Company

will concentrate production at new location and later discontinue output at El Bey.

Representatives of Macdonald Engineering Co., 420 Lexington Avenue, New York, are at Warsaw, Poland, negotiating with Polish Government for erection of grain elevators in different parts of country.

Compagnie Francaise des Petroles, Paris, France, is planning erection of two new oil refineries at Marseille and be-

tween Rouen and Havre, respectively. Plants will have by-products divisions and will cost over \$1,000,000.

Agulla Oil Co., Mexico City, Mexico, has secured permission for new oil refinery and terminal near city limits, to be terminus for new pipe line now under construction from Palma Sola to Mexico City, and which will furnish crude oil for refinery. Project will cost over \$2,000,000 with machinery.

New Trade Publications

Roller Bearing Units.—Shafer Bearing Corporation, Chicago. Catalog No. 10 illustrates and describes a wide range of stock mountings of roller bearings adaptable to machine and industrial applications. Types and sizes have been considerably increased, making these roller-bearing units available for wider range of applications.

Centrifugal Compressors.—General Electric Co., Schenectady, N. Y. Bulletin GEA-1280 of 12 pages, showing installation illustrations of centrifugal compressors, together with the salient features of construction.

Control Equipment.—Bristol Co., Waterbury, Conn. Catalog 4000, of 20 pages, illustrates and describes air-operated control equipment applicable to metal plants, power plants, rubber, textile and gas plants, and other places where industrial processes have to be governed on a definite schedule.

Welding.—American Steel & Wire Co., 208 South LaSalle Street, Chicago. Booklet of 32 pages, entitled "Welder's Handbook," outlines in detail, with illustrations, the subject of welding. Electric arc welding, gas welding, wire for welding and acetylene welding are dealt with.

Motor Chain Drives.—Diamond Chain & Mfg. Co., Indianapolis. Booklet 78 of 64 pages describes stock chain drives intended for the majority of motor and countershaft applications, and available from ¼ to 75 hp., in ratios up to 8.4 to 1, in motor speeds up to 1800 r.p.m. Complete tables, full instructions are given in the catalog, with many applications of this high-speed drive.

Cooling Towers.—Edwin Burhorn Co., West Fifth Street, Bayonne, N. J. Booklet 2 of 7 pages, entitled "Streams of Gold," and booklet 3 of 10 pages, both devoted to the subject of cooling systems. Installation views are shown.

Arc Welding Structural Steel.—General Electric Co., Schenectady, N. Y. Bulletin GEA-1161, of 24 pages, dealing with the story of arc welding from its early beginnings. Various charts showing sizes and weights are included, as well as considerable instructive data and diagrams.

Automatic Control.—Brown Instrument Co., Philadelphia. Booklet of 32 pages, "Era of Automatic Control," which deals with industrial progress in modern process control methods. Installation views of various up-to-date types of equipment are shown.

Constant-Temperature Viscosimeter.—American Instrument Co., Inc., 774 Girard Street, N. W., Washington. Four-page folder illustrating and describing the Aminco Saybolt-type, con-

stant-temperature viscosimeter, both universal and furol.

Air and Gas Compressors.—Pennsylvania Pump & Compressor Co., Easton, Pa. Bulletins 151 of 24 pages and 153 of eight pages, dealing respectively with duplex two-stage and duplex single-stage compressors and two stage tandem types of air compressors. Both booklets are illustrated, many installations being shown.

Pumps, Turbines, Compressors and Speed Reducers.—De Laval Steam Turbine Co., Trenton, N. J. Bulletin E-1140 of 40 pages, illustrates and describes various types of power and pumping units, turbines, compressors and speed reducers specially designed to meet the requirements of the oil industry.

Rotary Compressors and Dry Vacuum Pumps.—Yeomans Brothers Co., 1433 Dayton Street, Chicago. Eight-page bulletin (AC-7100), illustrating and describing automatic oil economizers, rotary compressors and vacuum pumps. Compressors are listed for pressures up to 50 lb.

Control Equipment.—General Electric Co., Schenectady, N. Y. Three folders, Nos. GEA-530B, GEA-1296 and GEA-388 respectively, of two pages each, illustrating and describing crane-hoist motors, direct-current brakes, and direct-current, series-wound, crane-bridge and trolley motors.

Portable Electric Light Plant.—Sullivan Machinery Co., 400 North Michigan Avenue, Chicago. Bulletin 100-B illustrating and describing "Sullite" portable electric light plants for the illumination of jobs that must be carried on at night time when electric light is not available from the usual sources. The plant is completely self-contained and will operate electric appliances and tools as well as provide illumination.

Milling Machines.—Cincinnati Milling Machine Co., Cincinnati. Three separate booklets bearing the common title of "Facts on Features," but devoted to the company's Hydromatic miller with locked hydraulic feed; the Nos. 2, 3 and 4 plain and universal and the Nos. 2 and 3 vertical millers; and the No. 2 cutter grinder, plain and universal, respectively. The booklets are in color and the illustrations and text are effectively presented. Performance and features are covered and complete specifications are given.

Power - Transmission Machinery.—Union Chain & Mfg. Co., Sandusky, Ohio. Illustrated catalog of 124 pages in the form of a treatise on modern high-speed power transmission, with engineering data and tables of special value to all who design and install high-speed drives. Installation views feature the wide variety of service into which these drives go.

Year's Ore Movement Low

Lake Shipments 18,621,618 Tons Below Those of 1929—
Smallest Since 1924

SHIPMENTS of Lake Superior ore by water during 1930 were 46,582,982 tons, a decrease of 18,621,618 tons, or 28.56 per cent, from last year, when the water movement was 65,204,600 tons. Water shipments in 1929 broke all previous records, although total movement last year was a little less than the record-breaking total of 1916, when considerably more ore was shipped by rail than last year. This year's movement was the lowest since 1924, when water shipments amounted to 42,623,572 tons.

The shipping season that ended with the sailing of two cargoes Nov. 23 closed earlier than for many years. The all-rail movement this year is estimated at 650,000 tons, making total shipments of approximately 47,233,000 tons. Shipments during November amounted to 1,987,688 tons, a decrease of 49.57 per cent, compared with the same month last year.

Ore shipping schedules were cut severely during the season owing to the depression in the iron and steel industry and, as a result, the amount

on hand at furnaces and Lake Erie docks Dec. 1 will be a little less than on the same day a year ago. However, with the present sharply decreased consumption the amount of ore at docks and furnace yards at the opening of navigation next year will probably be considerably more than it was at the start of the 1930 season.

Shipments by ports by water for November, for the entire year and for 1929 and total water shipments for 10 years are listed below.

Lake Ore Shipments by Water, Gross Tons			
	Novem- ber	Season 1930	Season 1929
Escanaba	193,529	4,096,813	6,348,573
Marquette	193,760	2,961,670	4,448,388
Ashland	185,016	5,061,374	7,620,060
Superior	599,192	14,153,553	19,623,139
Duluth	587,640	14,001,327	20,562,705
Two Harbors.....	237,551	6,308,245	6,601,735
Total	1,987,688	46,582,982	65,204,600
1930 decrease....		18,621,618	
Water Shipments of Last 10 Years, Gross Tons			
1921.....	22,300,726	1926.....	58,537,855
1922.....	42,613,229	1927.....	51,107,136
1923.....	59,036,705	1928.....	53,980,874
1924.....	42,623,572	1929.....	65,204,600
1925.....	54,081,298	1930.....	46,582,982

Taylor Society to Hold Three-Day Meeting

Eight general sessions, three simultaneous group conferences, a business meeting and a dinner meeting comprise the program of the annual meeting of the Taylor Society to be held at the Hotel Pennsylvania, New York, Dec. 3, 4 and 5. More than 30 members will contribute formal discussion at the general sessions.

"Factors in the Elimination of Distribution Wastes," will feature the opening session. The second session, to be held jointly with the National Association of Credit Men, will be devoted to discussion of "A Balance Sheet of Management to Supplement Financial Statements as a Basis for Credit Rating." On the evening of Dec. 3, Charles Henderson, president, S. S. White Dental Mfg. Co., Philadelphia, in a paper on "Some Experiences in Managing During the Past Decade," will outline the experiences of a plant "in which ounceage and not tonnage prevails; where diversification predominates over simplification; where the experience of age proves an acceptable substitute for the speed of youth; and where quality not mass distinguishes the product." This paper will be followed by two formal discussions on "Emphasizing the Problems of Managing for Quality."

"Maintenance of Standards" will be discussed at the morning session Dec. 4, and the simultaneous informal

group conferences in the afternoon will include discussion of "Comparison of Time-Measuring Mechanisms—Their Characteristics and Uses; Are Clerical Costs too High" (conducted by the New York Office Management Society); and "The Place of Merchandising in Industrial Organization." These will be followed by the annual business meeting and the annual dinner.

A paper on "Technological Unemployment," by Prof. P. H. Douglas, University of Chicago, and organizer of the recent Swarthmore College unemployment study, will feature the first session Friday, Dec. 5. In the afternoon, Morris L. Cooke, consulting engineer, Philadelphia, will present for public discussion the preliminary "Report of the Taylor Society Committee on an Industrial Code," which is a code of employer-employee relations.

The final session of the convention will be a symposium on "The New Challenge to Scientific Management," the propositions for discussion to be presented by Dr. H. S. Person, managing director, Taylor Society. The essential theme will be somewhat as follows: "Scientific management has given industry a technique of planning and control which has promoted the internal stabilization of individual enterprises; yet individual enterprises are subject to a large measure of instability because of instability in the industrial environ-

ment; therefore, should not industry apply the principles of organized planning and control on a higher plane or over a wider area than the individual enterprise?"

Mystic Opens Storage Yard at Kearny, N. J.

The recently reported purchase of 50,000 tons of pig iron by the American Radiator Co. was shared in very substantially by the Mystic Iron Works, Everett, Mass. It is generally thought that 50,000 tons did not represent the total radiator company purchase. While exact figures are not available, the Mystic Iron Works' portion undoubtedly represents the largest single order taken by an Eastern producer in many months. The iron is for the Bayonne, N. J., plant of the radiator company, and deliveries will start at once.

Pig iron inquiries and orders have appeared in better volume since the news of this purchase was published. This particular transaction, together with other large sales, brings the unfilled order book of the Mystic Iron Works to the highest point on record, and its deliveries are at a rate in excess of production, it is stated.

The Mystic Iron Works has announced an arrangement to distribute pig iron in northern New Jersey through the establishment of a large storage yard at Kearny on the property of the Seaboard By-Product Coke Co., an affiliated interest. Storage facilities at Jersey City, now held by Buffalo producers, have prevented the Mystic Iron Works from participating in New Jersey business except in barge lots. The latter method of delivery, involving, as it does, several hundred tons at once, is unsatisfactory to users generally. Under the new arrangement it will be possible for car lots and smaller tonnages to be delivered from stock piles on short notice.

In addition to rail shipments from Kearny storage, it is learned that the Boston company has concluded favorable arrangements for making truck deliveries to buyers' yards at Newark, Irvington, Harrison, Hoboken, Jersey City and other points.

Ryerson Buys Stocks of Boston Firm

Joseph T. Ryerson & Son, Inc., has acquired the stock and good will of the sheet metal division of the Richards Co., Inc., Boston. The Richards Co., founded in 1812, has been engaged in importing and distributing non-ferrous metals, rolled steel products and metal workers' supplies. It will continue in business, specializing in pig metals.

In 1926 the Ryerson organization first entered the Boston territory through the purchase of the Penn Metal Co. Two years later the plant, good-will and stocks of the E. P. Sanderson Co. were added.

Continental Mills Increase Steel Exports And Advance Price Levels

(By Cable)

LONDON, ENGLAND, Nov. 24.

THE general situation is unchanged, with export demand for pig iron and steel negligible and plants operating mainly on domestic engineering and structural steel contracts.

The Continental market is strong as a result of specifying by foreign merchants, and increased sales to the Far East following a reduction in ocean freights. Certain mills are well sold to the end of January based on operating rates usual at the year-end.

Welsh tin plate makers have abandoned their minimum price policy and invited non-members of the conference to join the plan of pooling output. It is considered probable that about 80 per cent of the outside mills will accept the proposal, as a joint subcommittee has been appointed to consider the necessary details.

The conference mills believe that by assistance to non-conference mills they will be insured a steady market at 16s. to 16s. 6d. (\$3.89 to \$4) per base box. Meanwhile prices have eased to 15s. 9d. (\$3.65) per base box, but the general outlook is healthier and prices are showing strength, as demand is improving.

British galvanizers have reduced prices of sheets for markets other than India to £11 5s. per ton (2.44c. per lb.) f.o.b. Ceylon is now included in the price scale for India and the quotation is £11 15s. per ton (2.54c.

Welsh tin plate mills abandon minimum prices and non-members of conference prepare to join.

* * *

Soviet places \$3,000,000 machine tool order with Associated British Machine Tool Makers.

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Manganese ore from western Rumania appears in Continental markets.

* * *

Japan may establish Amalgamated Steel Mfg. Co. to acquire all mills, including Government works.

The British safeguarding duty on cutlery will be terminated Dec. 22.

The Soviet trade delegation in the United Kingdom has signed a contract with the Associated British Machine Tool Makers for £600,000 (\$2,919,600) worth of machine tools for shipment up to October, 1931. The Association is to supply full credit terms and undertakes to provide Soviet industry with technical assistance in construction of machine-tool building plants.

The National Shipbuilders' Security Association has purchased and closed additional shipyards and negotiations are proceeding for acquisition of certain Northeast yards.

German production in October was 687,000 tons of pig iron, 856,000 tons of raw steel and 623,000 tons of rolled steel. At the end of October 68 furnaces were in blast.

Luxemburg output in October was 197,000 tons of pig iron and 195,000 tons of raw steel. At the end of October there were 26 blast furnaces active. Saar output in October was 146,000 tons of pig iron, 141,000 tons of raw steel and 106,000 tons of rolled steel.

Agreement Reported Among European Pipe Makers

DÜSSELDORF, GERMANY, Nov. 10.—German, French and Belgian cast iron pipe makers are understood to have

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at \$4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Ferromanganese, export.	£11 5s.	to £11 10s.	\$54.75 to \$55.95
Billets, open-hearth.....	5 12½	to 6 5	27.34 to 30.41
Black sheets, Japanese specifications	12 5		59.61
Tin plate, per base box..	0 16	to 0 16¼	3.89 to 3.95
Steel bars, open-hearth..	7 15	to 8 5	1.69 to 1.79
Beams, open-hearth.....	7 7½	to 7 17½	1.60 to 1.71
Channels, open-hearth...	7 12½	to 8 12½	1.66 to 1.87
Angles, open-hearth.....	7 7½	to 7 17½	1.60 to 1.71
Black sheets, No. 24 gage	9 0	to 9 5	1.95 to 2.01
Galvanized sheets, No. 24 gage	11 5		2.44

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£2 9½s. to £2 10s.	\$12.03 to \$12.15
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Billets, Thomas (nominal)	£3 10s.	to £3 12s.	\$17.03 to \$17.51
Wire rods, low C., No. 5 B.W.G.	5 2½	to 5 7½	24.94 to 26.15
Rails, light	6 0		29.20
Black sheets, No. 31 gage, Japanese.....	11 5	to 12 12	54.68 to 58.32
Steel bars, merchant....	4 5	to 4 7½	0.92 to 0.93
Steel bars, deformed....	4 5	to 4 7½	0.92 to 0.93
Beams, Thomas, British standard (nominal)...	3 16	to 3 17	0.84 to 0.85
Channels, Thomas, American sections	5 12	to 5 14	1.24 to 1.26
Angles, Thomas, 4-in. and larger, over ¼-in. thick	3 18	to 3 19	0.85 to 0.86
Angles, Thomas, 3-in....	4 3	to 4 4	0.88 to 0.89
Hoop and strip steel over 6-in. base.....	4 12	to 4 12½	0.99 to 1.00
Wire, plain, No. 8 gage..	3 15	to 3 17½	0.84 to 0.85
Wire, barbed, 4-pt. No. 12 B.W.G.	9 12½		2.09
Wire nails, base.....	5 15		\$1.26 a keg

reached an agreement on certain foreign markets. A German maker will curtail exports to countries outside of Europe and certain other German producers will cease exporting to North and South America, Great Britain and India. As compensation, certain French and Belgian producers will cease exporting to Germany, Austria, Switzerland and all the markets of southeastern Europe. The European cast iron pipe producers will not confirm such a distribution of foreign markets.

Germans Oppose New Cartel Quotas

DÜSSELDORF, GERMANY, Nov. 10.—Opposition to the plan of the Continental Steel Cartel to divide all quotas into export and domestic allotments is developing among German steel companies. The German mills base their objections on actual experience, as the German allotment two years ago was divided, with 28 per cent of the quota permitted for export.

Steel Cartel Fixes Year-End Output Quota

WASHINGTON, Nov. 18.—The Continental Steel Cartel, at a meeting Nov. 6, decided to reduce total steel production for November and December to a maximum of 4,500,000 metric tons, according to a cablegram to the Department of Commerce. Production in excess of this figure will be subject to the full penalty of \$4 a ton. Renewal of the cartel after Jan. 1 continues unsettled and will be discussed at a meeting in Paris on Dec. 5.

Rumanian Manganese Ore Offered in Europe

HAMBURG, GERMANY, Nov. 11.—Manganese ore from deposits in western Rumania is appearing as a competitor in European markets. The S. A. Manganul Bukuresti, which is exploiting the deposits, has appointed Askenasy & Edersheim in Berlin as sole agents for Central Europe. The costs of production at the new deposits are understood to be low and the ores high grade.

Japan May Merge All Steel Mills

YOKOHAMA, JAPAN, Oct. 23.—A report is expected soon from a special industrial conference appointed to investigate the advisability of combining all the important steel works in Japan. It is believed that the report will be favorable to the establishment of a new corporation which will acquire the Government Steel Works and other important plants. A bill probably will be submitted at the next session of the Imperial Diet, which will provide that a company to be known as the Amalgamated Steel

Mfg. Co., shall be formed and the steel industry of the country will be operated by it.

The Government, under this bill, would be a large shareholder, participating to the extent of the value of the present Government Steel Works at Yawata, the largest steel producer in Japan. The new company would be practically Government-controlled as the government would, by the terms of the bill, appoint superintendents to control the business of the company, audit its books and furnish reports and recommendations. The Government, in turn, could issue orders to the company, such as are deemed necessary in supervising the business.

European Hematite Pig Iron Agreement Canceled

WASHINGTON, Nov. 25.—The international hematite pig iron agreement has been canceled, effective Dec. 31, according to a cablegram to the Department of Commerce from Paris. Cancellation is attributed to the desire of French producers to operate independently and meet price competition.

Railroad Expenditures Large This Year

Capital expenditures of Class I railroads of the United States for new equipment and additions and betterments to railroad property totaled \$698,821,000 in the first nine months of the current year and were the largest for any corresponding period since 1923. This announcement was made by R. H. Aishton, chairman of the executive committee of the Association of Railway Executives last Thursday at the annual fall meeting of the association at the Biltmore Hotel, New York.

Mr. Aishton presented the following statement showing capital expenditures actually made in the first nine months of each year beginning in 1924, when reports by quarters were first received:

(In thousands of dollars)

	Equipment	Roadway and Structures	Total
1924.....	\$346,091	\$264,813	\$610,904
1925.....	255,893	279,141	535,034
1926.....	271,023	358,070	629,093
1927.....	204,992	365,223	570,215
1928.....	165,967	334,200	500,167
1929.....	210,689	363,131	573,820
1930.....	272,825	425,996	698,821

Capital expenditures for locomotives in the first nine months of 1930 amounted to \$66,043,000, an increase of \$21,356,000 above similar expenditures in the corresponding period of last year. Expenditures for freight cars were \$162,356,000, an increase of \$36,270,000; for passenger train cars, \$33,270,000, an increase of \$5,758,000; for additional main track, \$49,139,000, an increase of \$4,870,000; for heavier rail, \$40,215,000, an increase of \$6,220,000; for shops and engine houses, including machinery and tools, \$24,127,000, an increase of \$289,000; for bridges, trestles and culverts, \$44,384,000, an increase of \$1,131,000.

Railroads Agree to Give Work to Unemployed

Following a meeting of railroad executives in New York on Thursday, Nov. 20, this statement was issued:

"The Association of Railway Executives, at their regular annual meeting held today, gave their careful consideration to prevailing conditions, and in particular to the unemployment situation.

"Upon request of the President of the United States in the latter part of 1929, the railroads undertook an extensive program of construction and building of equipment in order to offset the threat of a substantial suspension of business activities, and they have practically carried out this program.

"In view of the continued depression and the consequent increase in unemployment, the railroads, notwithstanding recent unfavorable earnings, which may be expected to continue for a time, and notwithstanding the unsatisfactory cash position of some of them, have today, by a unanimous vote, declared it to be their policy to maintain their properties in condition necessary to handle effectively the traffic of the country and to carry on as far as is practicable work which may provide employment to the greatest possible number of men during the coming winter, and to continue improvement to both line and equipment.

"The railway executives continue to have faith in the fairness of the American public and the future of American railways, and in that belief have declared this progressive policy for the coming year."

Output of Steel Sheets Gained, Sales Declined

Production of steel sheets by independent mills in October increased a little over 7 per cent, as compared with September, and shipments gained 6877 tons, according to the monthly report of the National Association of Flat Rolled Steel Manufacturers. However, sales, which took quite a spurt in September, declined 55,754 tons. Sales during the month were 158,700 tons, production 193,934 tons and shipments 193,516 tons, production and shipments being practically the same. Unfilled tonnage also declined. The October report and comparisons in net tons follow:

	October	September	August
Sales	158,700	214,454	148,069
Production	193,934	179,928	173,956
Shipments	193,516	186,639	205,774
Unfilled orders.....	319,518	388,599	373,148
Unshipped orders.....	98,189	97,428	99,925
Unsold stocks.....	91,024	88,363	82,315
Capacity per month...	566,600	545,200	529,600
Percentage reporting..	67.6	67.6	67.6

Percentages, Based on Capacity			
Sales	41.4	58.2	41.6
Production	50.6	48.8	48.6
Shipments	50.5	50.7	57.5
Unfilled orders.....	83.4	105.5	104.3
Unshipped orders.....	25.6	26.4	27.9
Unsold stocks.....	23.8	24.0	23.0

Mexican Steel Output Grows

Tariff Aids Domestic Mills to Supplant Foreign Products

WASHINGTON, Nov. 22.—That Mexico, like some other countries, is becoming more nearly self-contained in meeting its iron and steel requirements is shown by an analysis of its iron and steel industry prepared by the Department of Commerce. Expansion of Mexican capacity and the broadened range of output has been materially aided by the government's consistent policy of granting tariff protection, especially in those instances where sincere effort was made to produce manufactures new to the Mexican industry.

While the volume of imports during the past six years has shown no great fluctuation, and has averaged 115,815 metric tons, there has been a marked decline of incoming shipments in certain products which Mexico itself now supplies. Maintenance of a steady level of imports is attributed to natural growth of demand.

Illustrative of the effectiveness of the protection policy, import duties on bars, balls, linings and similar products for grinding mills used in the mining industry were increased in 1926, with the result that demand is now almost entirely supplied by domestic manufacturers. In 1928 two Mexican companies began production of both bright and galvanized wire, so that today, as a result of tariff protection, competition from imported wire virtually has been eliminated. Also duties were raised on corrugated sheets, with the result that sheets of this kind are no longer imported. There are some 20 corrugating machines now in operation in Mexico. Two Mexican companies are engaged in installing galvanizing plants and it is expected that imports of galvanized sheets will be substantially affected in 1931.

The significance of the report lies in the fact that it brings out in detail a trend that is characteristic of other countries and which will probably affect the future export trade of the United States and other large producing countries, necessitating cultivation of new markets with increasing intensity.

Production of pig iron and crude steel in Mexico is almost, if not entirely, from the plant of the Monterrey Iron & Steel Co. The 1929 output is easily the highest achieved by the Monterrey company in raw steel and rolled products.

The only rolling mills in Mexico other than those of the Monterrey company include the Consolidated Mills & Foundries Co., S. A., which makes a variety of products. Its principal output has been railroad material. It also produces bar iron, bar steel, balls and linings for grind-

ing mills, bolts and nuts, screws, nails, track bolts, rivets, washers, track spikes, light rails, fish plates, tanks and culverts, Babbitt metal, railroad and automobile springs, bright and galvanized wire, electric steel castings and vanadium steel, as well as battery zincs and non-ferrous castings. A third company is the Nierro y Acero de Mexico, S. A., of Avenida Morelos 17, Mexico City, which produces commercial iron as well as steel castings.

Rails Made by Mexican Mills Supply Domestic Needs

Domestic production takes care of practically the entire demand for rails and other track material except steel cross ties, which are imported from Germany and Belgium from time to time, and light rails for use on the plantations of Yucatan. The bulk of the spikes, bolts and nuts are also made in Mexico, but a small ton-

nage is imported from the United States and Germany.

German competition with American products is principally in barbed wire, tubing, poultry netting, enameled ware and heavy steel plates. Germany supplies from 25 to 30 per cent of imports of these kinds. German export houses also control the bulk of business in steel tubing and brass covered steel tubing, selling far below the American price. Germany was formerly a strong competitor in pipe, but following the conclusion of an international agreement, the Mexican market is now in the hands of American producers.

British competition is felt principally in tin plate and plain galvanized sheets. It is estimated that from 10 to 20 per cent of the galvanized sheet business goes to British producers, with the United States the leading supplier. Black sheets are imported chiefly from the United States, although it is estimated that some 35 per cent of this trade goes to Belgium producers.

Import duties also reserve the local market for nail wire to Mexican makers. Structural shapes up to 15 in. in width are rolled by the Monterrey company, and above this width the United States is the chief supplier.

British Iron and Steel Output Lower

LONDON, ENGLAND, Nov. 14 (*By Cable*).—Pig iron and steel output for Great Britain in October was less than in September at 415,000 gross tons for pig iron and at 512,500 tons for steel ingots and castings. Both are also under the monthly averages for 1929.

The monthly output in gross tons this year, with comparisons, is shown below:

	Pig Iron	Steel
October, 1930.....	415,000	512,500
September, 1930.....	425,000	580,600
August, 1930.....	416,700	451,300
July, 1930.....	486,100	621,400
June, 1930.....	563,200	600,100
May, 1930.....	614,500	692,800
April, 1930.....	619,600	696,100
March, 1930.....	665,800	826,100
February, 1930.....	597,000	776,400
January, 1930.....	650,000	771,100
Monthly average, 1929.....	631,600	800,600

Swedish Metallurgist to Lecture Here

Dr. A. F. Westgren is to deliver the annual lecture before the institute of metals division of the American Institute of Mining and Metallurgical Engineers at the annual convention in New York the week of Feb. 14. Dr. Westgren is professor of general and inorganic chemistry at the University of Stockholm, Sweden. One of his achievements has been an investigation of the crystal structure of the modifications of iron. Another has been X-ray investigations of alloys on which he has published some papers.

Previous to and after the convention

of the mining engineers, Dr. Westgren will deliver a number of lectures according to the schedule given in the following:

Franklin Institute, Philadelphia, Feb. 5; New York chapter, American Society for Steel Treating, Feb. 9; Lehigh University, Bethlehem, Pa., Feb. 13; Columbia University, New York, Feb. 20; Yale University, New Haven, Conn., Feb. 22 to 25; Massachusetts Institute of Technology, Cambridge, Feb. 26 and 27; General Electric Co.'s laboratory, Schenectady, N. Y., Feb. 28; Carnegie Institute of Technology, Pittsburgh, March 3 to 6; University of Minnesota, Minneapolis, Minn., March 7 to 13; Battelle Memorial Institute, Columbus, Ohio, March 23 to 25.

Definite dates have not yet been selected for engagements at Cleveland, Chicago and Cincinnati.

Mono-Cast Pipe Shop for Large Sizes Ready Soon

The American Cast Iron Pipe Co., Acipco, Ala., will be ready to start operations about the first of the year in a new mono-cast centrifugal pipe shop for large diameters. Pipe will be made in 14, 16, 18, 20 and 24-in. sizes in 16-ft. lengths, bell and spigot type, with a bead cast on the spigot end. The new shop will have a potential capacity of 200 tons of centrifugally cast pipe per shift and can be operated 24 hr. a day if required.

During the relatively short time that mono-cast pipe in the smaller diameters have been made, more than 2000 miles of it has been placed in service.

Comprehensive Program for A.S.M.E. Annual Meeting

DRAMATIC and unusual situations will mark the annual meeting in the first week of December in New York of the American Society of Mechanical Engineers. As cogently put by the A.S.M.E. News, they will be as follows:

A great naval constructor, Admiral D. W. Taylor, is to receive the John Fritz Medal, the highest award in the gift of the engineering profession. A leading American scientist, Elihu Thomson, will be inducted into the society as an honorary member. A progressive thinker in economics, Dr. Wesley C. Mitchell, and a pioneer engineer philosopher, Ralph E. Flanders, are to discern the omens of future economic situations arising out of the present rapid engineering development. A man of outstanding social consciousness, Prof. Elliott Dunlap Smith, is to dramatize the encounter of engineering with human nature. A series of three lectures by Prof. S. M. Tucker on "Talking with an Audience," will give engineers helpful suggestions on the best methods of "getting ideas across."

More than a score of engineers will exhibit their offerings of fine art, the product of their spare moments, so that their fellow engineers may enjoy them. A splendid technical program will provide the usual debating ground and a fine list of excursions rounds out the program for the men.

More than 60 papers will be presented at the 26 technical sessions planned for the annual meeting of the American Society of Mechanical Engineers, to be held at the Engineering Societies Building, New York, Dec. 1-5.

In addition, there will be the usual luncheon meetings, conferences and meetings of technical and other committees, as well as the annual business meeting, which will be held on the evening of Dec. 1. President's night, with the reception and dance, is scheduled for Dec. 2, and the annual dinner for Wednesday evening, Dec. 3. At the latter Elliott Dunlap Smith, professor of industrial engineering, Yale University, will speak on "Can the Engineer Be a Man?" Features of this year's program are the lectures on public speaking, planned for the mornings of Dec. 2, 3 and 4.

Machine-shop practice sessions, Dec. 2, include papers on a "Survey of Surface Quality Standards and Tolerance Costs Based on 1929-1930 Precision Grinding Practice," by R. E. W. Harrison, with an "Appendix" by C. B. Sawyer, and a paper on "Transmission of Torque by Means of Press and Shrink Fits," by J. W. Baugher, Jr. At the second session, C. C. Nitchie will speak on "Application of Spectroscopic Apparatus to Industry," and M. L. Sandell, on the "Uses of 16-MM Movies in Industry."

A "cutting of metals" meeting on the morning of Dec. 4 includes papers on "Tool Steel Tools," by A. H.

d'Arcambal; "Cemented Tungsten Carbide as Applied to Cutting Tools," by L. J. St. Clair; and "Stellite Cutting Tools," by E. A. Becker, E. E. Gordon and W. A. Wissler. "Machining Properties of Some Cold Drawn Steels" will be discussed by O. W. Boston at the general session on the morning of Dec. 3.

Materials handling will be discussed at three sessions. Papers at the first include "Materials Handling Methods in the Fisk Tire Plant," by C. E. Maynard; "Materials Handling in Warehouses," by N. E. Whittemore, will feature the second session, Dec. 2, while the presentation of the report by the materials handling committee will occupy the afternoon meeting, Dec. 2. "Crane Lubrication," by E. H. Thompson, will be among the papers at the lubrication engineering session, Dec. 1.

Papers scheduled for the properties of metals meeting, Dec. 5, are "Properties of Non-Ferrous Metals at Elevated Temperatures," by C. L. Clark and A. E. White; and "Comparative Physical Properties of Chromium-Nickel, Chromium-Manganese and Manganese Steels."

A management session, with Wallace Clark speaking on "American Management in Europe," is planned for Dec. 4. A symposium on industrial accident prevention has been arranged for Dec. 1, and an apprentice training session for the morning of Dec. 3. The latter will include: "Apprentice Training in Virginia," by C. F. Bailey; "Apprentice Training in Wisconsin Industry," by H. S. Falk, and "Opportunities for Aviation Training," by J. S. Marriott. Discussion of "Stabilization of Employment in Industry" is planned for the morning of Dec. 3.

Sessions will be devoted to lubrication research, applied mechanics, mechanical springs, hydraulics, railroads, aeronautics, industrial power, central station power, oil and gas power, boiler furnace refractories, fuels, refrigeration, textiles and printing.

Symposium on Metals at High Temperatures

A symposium on the effect of temperature on the properties of metals will be a feature of the annual convention of the American Society for Testing Materials to be held at the Hotel Stevens, Chicago, June 22 to 26, 1931. It will be held under the joint auspices of the American Society of Mechanical Engineers and the A.S.T.M. The program is being developed by Dr. H. W. Gillett for the joint research committee on the effect of temperature on the properties of metals of the two societies. The subject of the engineering properties of castings is also being developed in cooperation with the American Foundrymen's Association, and it is expected that a phase of this general subject will be presented at the symposium.

Employment Rising at Shipbuilding Plants

WASHINGTON, Nov. 24.—Employment in 10 shipbuilding and ship repairing plants in the United States rose to 23,238 men on Nov. 1 from 22,608 on May 1, according to the Shipping Board. Most of these employees are working on vessels being constructed or rebuilt for foreign trade with the aid of funds loaned by the board under the Jones-White act. In the aggregate the vessels cost \$121,492,528. The majority of the vessels are less than half completed. There are also pending several ship construction contracts. Since March, 1923, when the first loan for ship construction was made by the board, loans totaling \$131,793,003 have been authorized on vessels costing in the aggregate \$186,466,688.

Illinois Manufacturers Oppose Rate Reopening

The Illinois Manufacturers' Association has filed an answer to the petition of the Western Trunk Line carriers for reopening, reconsideration and modification of the report on Rate Structure Investigation, Western Trunk Line Class Rates, No. 17,000, Part 2, and Class Rates within the Western Trunk Line territory, Ex Parte 87.

The petition sets forth that the association has a membership of 2800 firms, corporations and individuals manufacturing and shipping goods throughout this country. It states:

"The establishment of carload commodity rates upon a fixed percentage of relationship of the first class rate, we believe, is an experiment, commercially impractical in its application and may seriously disturb the business of this country.

"The destruction of long established rate structures and competitive relationship between individuals and localities by the rigid application of a distance scale of rates will cause commercial disturbance and may result in industries being moved from one location to another, and as a result whole communities which have grown up around these industries may be seriously affected.

"The rate of progression of a class rate distance scale is, we are convinced, entirely unsuited to many highly competitive articles of commerce produced in various sections of the country and shipped generally in carloads, and is not conducive to the industrial and transportation interests of this country.

"The petition of the Western carriers for modification of the report on the record as made by increasing the percentage relationship of the fifth class rate to first from the prescribed 35 per cent to 40 per cent if reopened it should be for further hearing and reconsideration by interested parties."

Grain Growth in the Chrome-Irons

(Concluded from page 1589)

chromiferous ferrite increases with increasing temperature. If the carbon content of the steel exceeds the solubility limit of carbon in delta iron, the excess carbon prevents the complete suppression of the austenite and, therefore, manifests itself in the form of a solid solution of carbon in gamma iron. The solubility of carbon in delta iron (containing 28 per cent chromium) is apparently less than that reported by previous investigators. The authors believe that the limit is approximately 0.10 per cent carbon.

Steel Plant Built at the Door of a Great Market

(Concluded from page 1610)

pany's property comprises a rectangular block of 225 acres with a frontage of about 2800 ft. on the river. It is bounded on the north by a navigable slip separating it from the docks of the Nicholson Terminal & Dock Co., on the south by the property of the Michigan Central Railroad Co., and on the west by the Michigan Central and Detroit, Toledo & Ironton railroads. The plant is served by both railroads, and water facilities permit dockage of lake vessels.

As originally assembled, the property contained three slips. The filling of two of them and raising the general elevation for proper sewerage and track facilities were carried out by means of a hydraulic sand fill. This method, which called for placing of as much as 6000 cu. yd. of sand a day, enabled the construction program to proceed without delay. The first sand fill was begun May 25, 1929, excavation started June 12 and the first piling was driven June 29. As very heavy foundations are required for mills of this type, as much as 1000 yd. of concrete was poured daily, this work starting on Aug. 14. The first structural steel was set on Oct. 28, 1929, and almost exactly 10 months later, on Aug. 23, 1930, the first steel was produced in the new plant. Construction was maintained continuously—both day and night whenever possible—throughout the winter of 1929-1930 to achieve this result.

The plant is arranged so that future extensions can be made with minimum interference with operations. The units are laid out so as to obtain straight-line production with a minimum of travel, the raw material after receipt never entering a railroad car until shipped out as finished products. Near the mills is a 75 x 100-ft., two-story brick office building for the engineering and operating officials.

Contractors and Suppliers of Equipment

The list of contractors who built the plant and of companies furnishing equipment follows: Structural steel, McClintic-Marshall Co., Pittsburgh; soaking pit and open-hearth furnaces, Alex Laughlin Co., Pittsburgh; waste heat boilers, Freyn Engineering Co., Chicago; open-hearth valves, Blaw-Knox Co., Pittsburgh; cranes, Morgan Engineering Co.,

Alliance, Ohio; electric controllers, Cutler-Hammer Mfg. Co., Milwaukee; rolling mills, Mesta Machine Co., Pittsburgh; electric motors, General Electric Co. and Westinghouse Electric & Mfg. Co.; oil-electric locomotives, Westinghouse Electric & Mfg. Co.; hot metal cars and ladles, Treadwell Construction Co., Midland, Pa.; reheating furnaces, Chapman-Stein Co., Mount Vernon, Ohio; normalizing furnaces, Surface Combustion Co., Toledo, Ohio; gas producers, Wellman-Seaver-Morgan Co., Cleveland; excavation, pile and foundations, Raymond Concrete Pile Co., New York; sand fill, Construction Materials Co., Chicago; office buildings, C. O. Barton Co., Detroit.

Successful Machine Polishing of Metals

(Continued from page 1599)

posed. In setting up the wheel a protective head of glue should be placed on it before the glue that holds the abrasive is applied. As soon as the wheel wears down to this particular head, it should be removed from service, the old abrasive removed and a new head applied.

Given this treatment, the diameter of the wheel should be maintained fairly constant for a period of years and no provision, therefore, need be made for a change in spindle speed due to wheel wear. In the design or selection of a polishing machine, attention should be given to the ability to change the spindle speed if the character of the work is such that there will be changes in the wheel diameter from time to time.

Speed Depends on Two Factors

Speed of the work past the wheel depends on the material of which the work is composed and the degree of finish required. It varies between wide limits. Strip zinc can be fed against the wheel at the rate of 200 lin. ft. per min. whereas 15 ft. per min. is a high rate of speed for rustless steel. It frequently happens that the polishing machine has a capacity of from 200 to 300 pieces of given size and shape per minute, but it is manifestly beyond the ability of an operator to feed work at this rate, particularly where the work must be more or less accurately placed in work-holding fixtures. It sometimes is possible to arrange machines so that two or three operators can load it, the unloading being taken care of by an equal number of operators, or automatically.

Excessive pressure greatly increases the operating cost, as it wastes grain, glue and labor for the setting up of wheels, and it also requires more operations on the work, due to the inefficiency of highly heated wheels. In most cases of machine polishing, particularly in straight line work, it is desirable to approximate the effect of presenting the work to the wheels at varying angles by either moving the wheel or work transversely to the line of travel to the work past the wheel.

In some classes of work it may be desirable to divide the cushion required for flexible grinding between the wheel and the work. The wheel is made

Business as Others See It

Digest of Current Financial and
Economic Opinion

IMPROVEMENT in the spring, appears to be the general verdict of observers. Building activity, however, cannot be too much depended on to lift us out of the slough. As one commentator puts it, "This country has only recently equipped its industrial and commercial plant to accommodate a boom, so that it will be some time before there is need for any very large volume of new construction. . . . There is a question whether the utilities have not also been somewhat overdone."

One distinct benefit, making for stability in individual plants and for lowered costs, is noted by Alexander Hamilton Institute as having come from the troubled business waters. Factory labor turnover in 1930 has been far less than in 1929. Average monthly separations have been 2.59 per cent, against 3.97 per cent, a drop of more than one-third. Voluntary quits were 1.22 per cent of number of employees, or only two-fifths of the 3.04 per cent prevailing in the first nine months of 1929.

In this connection *Commerce and Finance* says, "Less has been heard

of unemployment since the election. . . . There is lots of work for those who are willing to take it."

Lowered Payrolls a Heavy Handicap

Nevertheless National Industrial Conference Board finds enough unemployment and lowered payrolls to conclude that "the net result is the further retarding of the ability of consumers to absorb the goods now available to them. . . . [But], the drastic curtailment of production and the usual seasonal stimulus to retail trade during the rest of the year, it is hoped, will help lay the basis for business recovery in the next few months."

Mixed influences are noted by Guaranty Trust Co. of New York, which refers to "unmistakable continuation of the decline in industrial output and volume of trade. . . . On the other hand, the movement of stock prices, commodity prices and bank credit, three highly important influences on the general trend of business, have all been such as to suggest that the process of readjustment is moving into its final stages."

Declining industrial activity is more responsible for pulling down the business index, thinks *Business Week*, than is general trade. "This fact lends some support to the hope that the lower it goes the sooner it will turn up. . . . Selling which energetically seeks out the buyer's unsatisfied wants and is intelligently related to his means is as sound and as possible in depression as in prosperity."

Manufacturing Activity Lower Than Trading

Certain of the industries producing consumers' goods are likely to be among the first of the manufacturing industries to present signs of recovery from the current depression, as in 1921, says Harvard Economic Society. "The present low level for certain of these industries suggests that curtailment will not go much further. . . . The decline in basic industry may continue for a few months longer. But, if this occurs, the index will be so far below normal that more than brief continuance there would be improbable."

of proper density and cushion to give the desired finish and a cushion surface is also provided under the work to enable it to give sufficiently to take care of slight variation in contour that would cause the wheel to cut deeper, were the work not able to recede somewhat from the wheel.

Common Causes of Vibration

Vibration in the polishing machine produces the same evil effects as it does in any other kind of a machine except that these effects are magnified due to the very nature of the work that the machine is called upon to do. The more common causes of vibration are: Inadequate machine foundation, improperly or lightly constructed buildings, light floors, machines being improperly located on upper floors, insufficient weight in machine bases, shafts too light, or with bearings too far apart giving them a tendency to whip at high speeds, insufficient bearing surfaces, improperly braced machine members, or members whose vibration period corresponds to some recurrent motion in some moving part of the machine, and unbalanced polishing wheels.

Vibration may also be caused by the work being improperly seated in the fixtures, although such vibration usually is local and is confined to the work itself. Too much cushion may also tend to set up vibration in the polishing wheel. The function of

a fixture is to hold the work firmly, to present it in the correct position to the polishing wheel and in such cases as may be necessary to provide a certain amount of resiliency and automatic adjustment of the work to the wheel. They should hold the work so it cannot be dislodged when it comes in contact with the wheel. They should be easy to load and unload. All fixtures should have provision for compensation of wear and in those cases, where the fixture masks a portion of the work for one reason or another, the masking part must be capable of easy replacement.

A BRITISH trading company recently purchased the unshipped balance of the 1930 production of four Russian wooden door factories, said to approximate 50,000 doors. Further it has contracted for the entire 1931 production, which is expected to exceed 630,000 doors. Obviously the situation spells disaster for the Swedish manufacturer, hitherto the supplier. Aside from the reported inclusion of the four Russian factories in the fair list by the British joint employer-employee committee, with the implications suggested as to relations between British labor unions and the Soviets, it appears that British business men prefer to have these Russian doors marketed through strong firms rather than that they be thrown on the market directly by the Russian interests concerned.

This Issue in Brief

NEXT WEEK

Some alloys now used in tool steel making will become obsolete as soon as sufficient experience is accumulated to determine which are really worthy of adoption as standard types, says Doctor Matthews. Many alloys produced during the past few years are already obsolete.—Page 1674.

Tool steel cannot be bought intelligently by analysis alone. Manufacturing procedure has considerable effect on quality. "A brand is something more than a name on a piece of steel," says tool steel maker.—Page 1675.

Fatigue causes final failure of anti-friction bearings in roll necks, unless flaws exist in one or more of the balls or rollers. Unless average and maximum loads are known, bearings cannot be designed intelligently. — Page 1677.

Destructive effects of higher and higher speeds in heavy rolling mills is due entirely to stress caused by impact. The specific resistance to compression does not grow perceptibly beyond compression rates of 5 per second.—Page 1678.

To avoid losses due to failure of anti-friction bearings in heavy applications, examine the bearings either by X-ray or by the Sperry electric method, engineer suggests. This would be relatively inexpensive compared with cost of the bearing.—Page 1679.

In getting a welding specimen for test, be sure to remove the specimen longitudinally out of weld metal of sample welds. The notching of a specimen, whether of brittle or ductile material, will give inaccurate results.—Page 1680.

Is the weld ductility test needed? Yes, says advocate, for this test reveals information not developed by tensile test. No, says objector, for high ductility is not needed in structural work.—Page 1681.

Among the high spots of next week's issue will be the following:

Unwise practice of too hastily or unthinkingly responding to the intriguing so-called bargain prices. The result is often inventories out of balance with demand, not to mention likely delays in material deliveries, with all that this may mean.

Money savers in the foundry, covering economies in the matter of sand and especially in the matter of handling materials, cogently put through the use of numerous illustrations.

Ford development in the making of push rods by the die-casting process and machining them.

Grinders are paid on the basis of pounds of material removed. Castings are weighed before and after they have been ground. Steel foundry molders are paid on basis of 1000 cu. ft. of sand rammed, plus certain extras.—Page 1687.

Low profit in cold-rolled strip steel will bring about the abandonment of less efficient units. Present capacity is more than twice what is needed.—Page 1694.

Pleads for revision of strip steel schedule of extras. Price structure is inconsistent, says engineer.—Page 1695.

Internal friction has a marked effect upon the average pressure in rolling thin strips.—Page 1678.

Tests corrosion resistance of chrome-iron by boiling in nitric acid for five 48-hr. periods. Corrosion rate is arrived at by weighing the specimens at intervals.—Page 1696.

"Electric eye" helps maintain proper tension in reeling fine wire. Tension weight rests on floating pulley. When tension is too high or too low balanced solenoid energizes the thyatron, controlling the speed of the driving electric motor.—Page 1667.

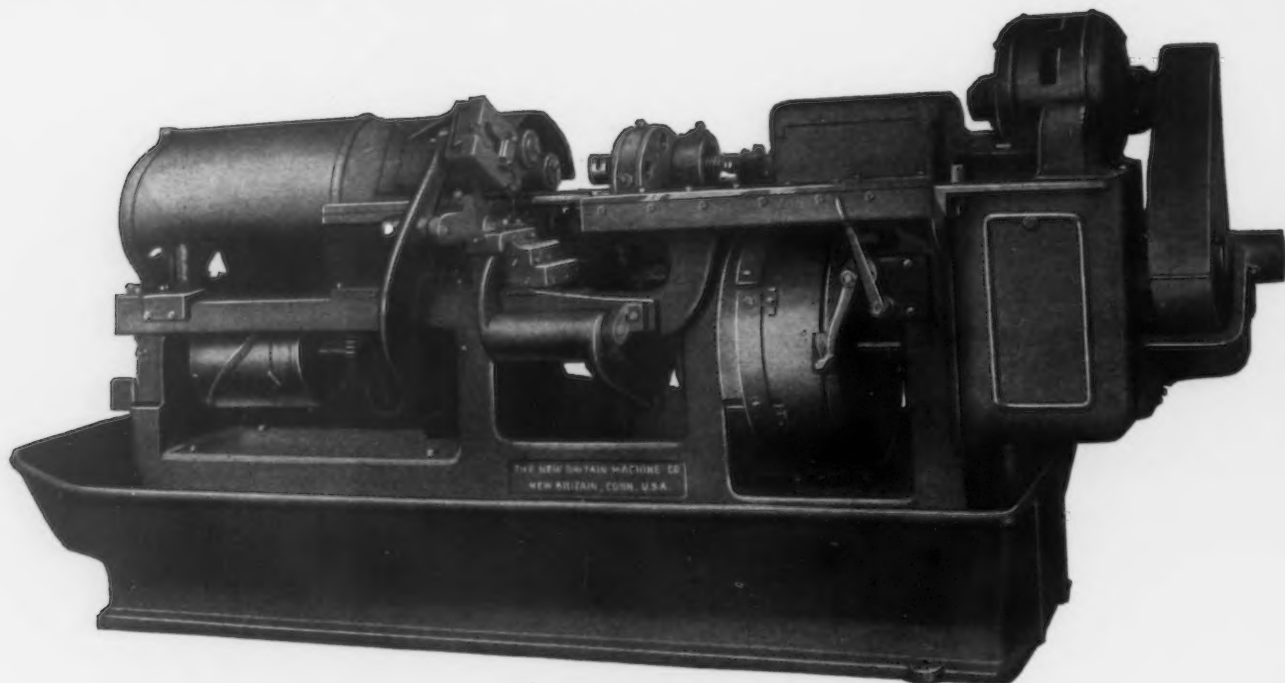
Is rust-resistance of cast iron increased by addition of sodium? Metallurgist finds that certain cast iron vessels, used in electrolysis, which have absorbed sodium, either mechanically or as an alloy, have not rusted, even after some months.—Page 1692.

Steel castings heat-treated with practically no scale. Furnace is push-type, oil-fired. Castings are brought to proper temperature in the first unit, then pushed out into the space between the two units. After air quench they are drawn into the second unit.—Page 1687.

Shovelless foundry's sand is hardly touched by human hands. Sand from shake-out grid is carried in bucket elevator to top of a large sand-treating apparatus, where a revolving drum breaks up the sand and charges it on a revolving plate where it cools.—Page 1686.

Addition of nickel to ordinary types of gray iron has little effect on tensile or transverse strength. Exception is noted when nickel is added to low silicon mixtures, which otherwise would be weak and brittle or hard, as in this case physical properties are much improved.—Page 1688.

Fatigue tests for fillet welds made on testing machines with cantilever specimens reveal that these welds fail at the base of the fillet or through the fillet. For given dimensions of welded parts there is a critical size fillet for which failure occurs both ways simultaneously.—Page 1681.



NEW BRITAIN SIX SPINDLE SCREW MACHINES

Parts which ordinarily require subsequent operations and additional equipment for completion often may be entirely finished on New Britain Screw Machines.

Six end and four or five cross slide positions permit the use of extra tools or attachments which make these additional operations possible.

New Britain Six Spindle Screw Machines are built in four sizes: $\frac{5}{8}$ ", 1", $1\frac{5}{8}$ " (illustrated), and $1\frac{3}{4}$ ".

THE NEW BRITAIN-GRIDLEY MACHINE CO.
NEW BRITAIN, CONN.
U. S. A.



